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Syllabus

TECHNOLOGY FOR HIGHER EDUCATION

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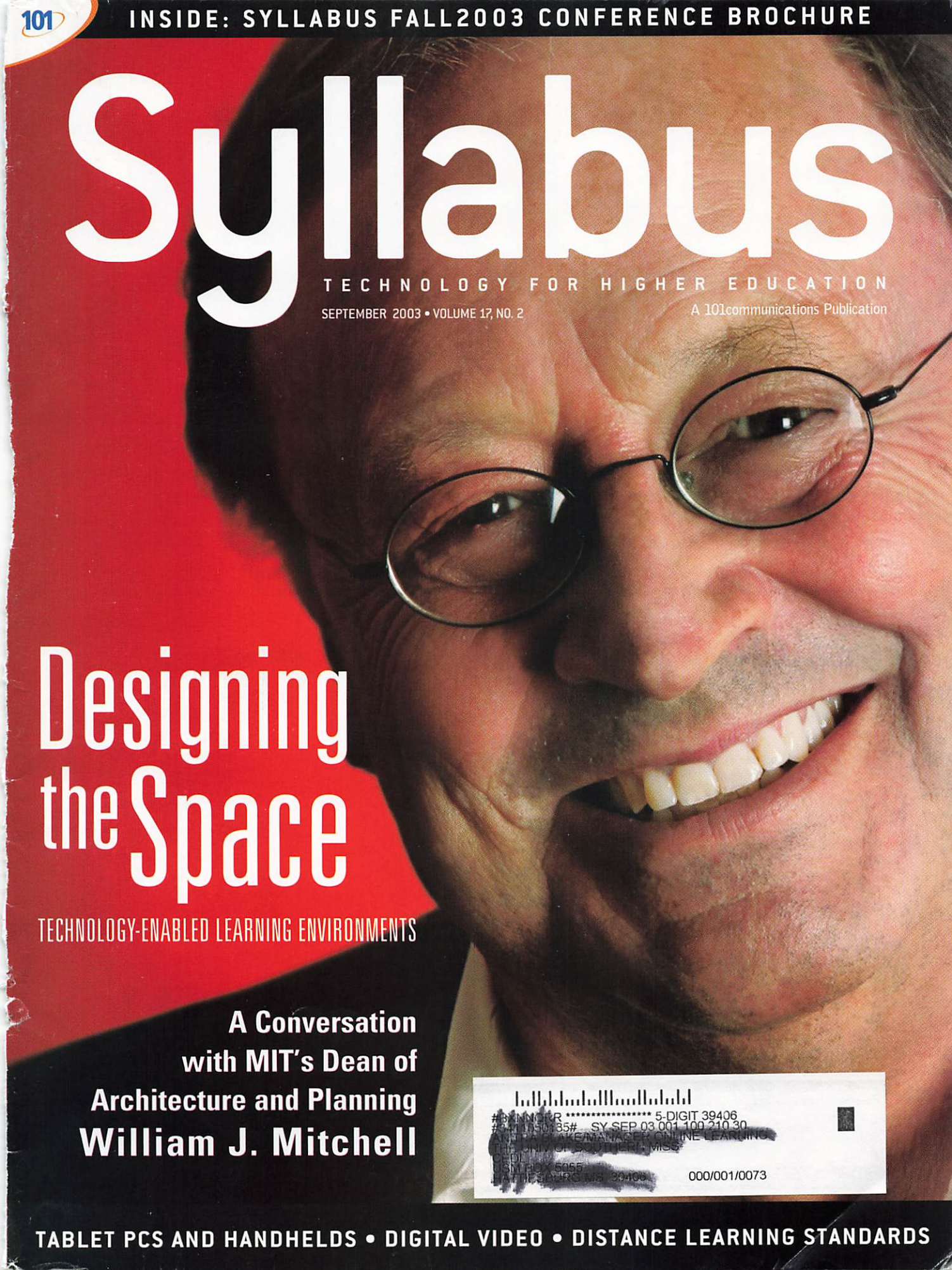

Designing the Space

TECHNOLOGY-ENABLED LEARNING ENVIRONMENTS

A Conversation with MIT's Dean of Architecture and Planning William J. Mitchell

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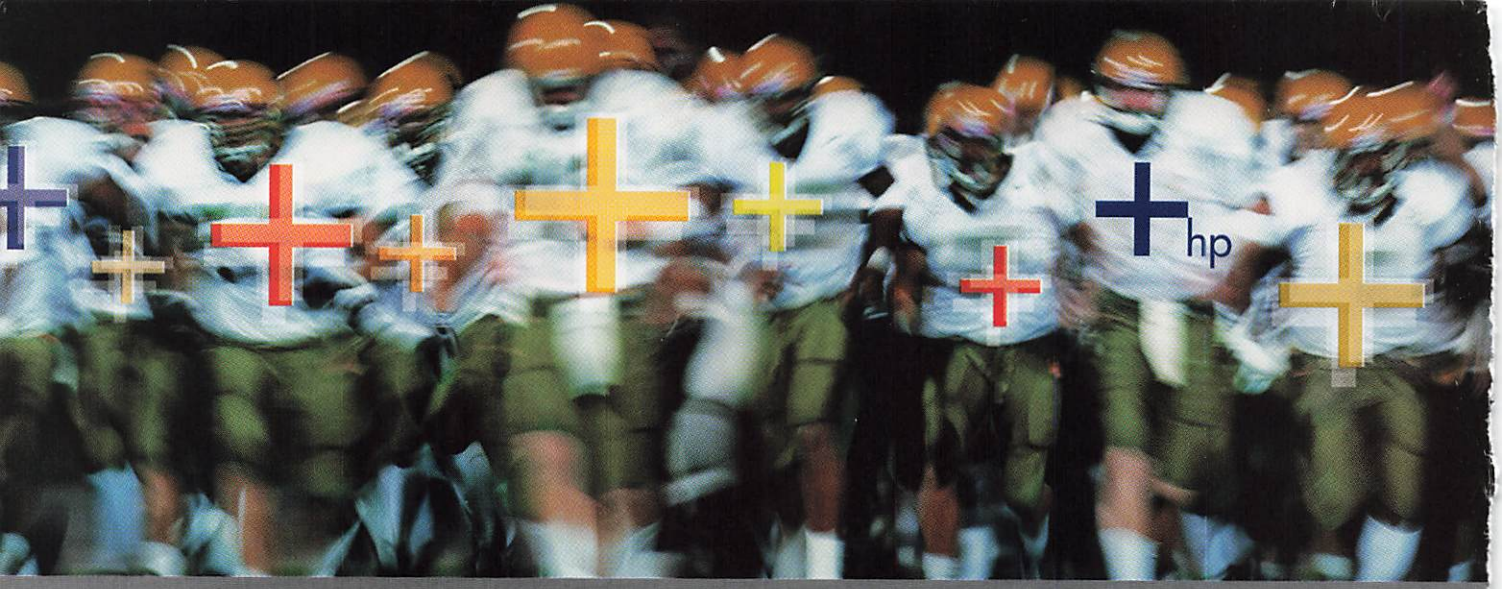
TABLET PCS AND HANDHELDS • DIGITAL VIDEO • DISTANCE LEARNING STANDARDS



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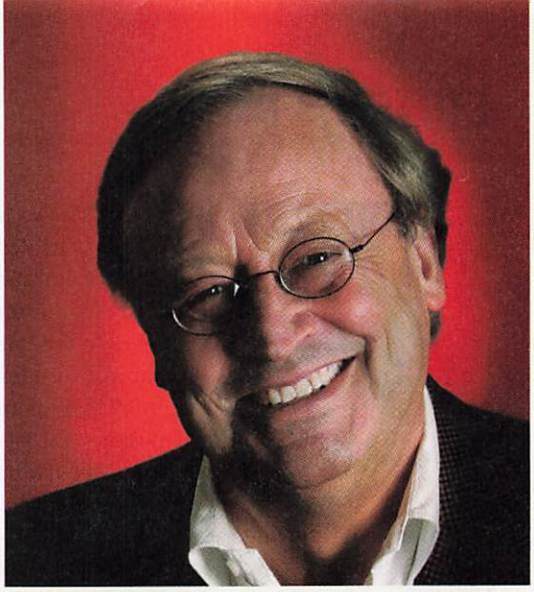

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EDITOR'S NOTE

Mary Grush, Editor

In this issue of *Syllabus,* we explore technology-enabled learning environments—both brick-and-mortar and virtual—along with some of the tools that support them. As technology matures, it continues to become more distributed and better integrated into our daily routines and physical surroundings. A combination of more portable, wireless devices and collaboration technologies will open up the possibilities for new, flexible classroom or laboratory spaces based on interactive and experiential learning.

In our lead feature interview, "Designing the Space" (page 10), William Mitchell, Dean of MIT's School of Architecture and Planning, offers his views about the design of learning spaces and how technology fits into the planning process for higher education architectural designs. Mitchell says that "...we can enrich those settings by overlaying them with digital technology," pointing out that it's now much less necessary for technology to dominate the design. The technology will fade into the background, allowing architects and planners to focus on human needs and interactions, while leveraging digital technologies for learning.

Several technologies encourage collaboration and social interactions while offering easier access to course content and related information sources. Tablet PCs mix content and interactivity, and return us to a 'back-to-basics' learning environment, say University of British Columbia's Cyprien Lomas and Ulrich Rauch in their feature, "Learning with Tablet PCs: True Learning Tools or Trendy Devices?" (page 19). And as University of Nebraska professor R. David Clark notes in his article, "Putting Chemistry in the Palm of Your Hand" (page 22), working with course-related information can now include the manipulation of dynamic content such as data acquired live via sensors connected to handheld devices in the laboratory.

Today, learning may take place in local classrooms, lecture halls, or labs; or, students may access virtual environments. Digital video is making it easier for educators to bring their own unique teaching personalities to their online courses. Matthew Nickerson, of Southern Utah University, examines the role of digital video in his article, "Giving Online Humanities Instruction a Human Face" (page 26). And with more courses offered in online environments, designing programs to accepted standards becomes more critical. But what are those standards? Linda Bruce, an instructional designer at Johns Hopkins Bloomberg School of Public Health, provides some good resources in "The Standards Approach: Planning for Excellence in Distance Education" (page 29).

Design issues will be well represented at the Syllabus fall2003 conference, to be held December 8-10 in Cambridge, Massachusetts. William Mitchell will give a keynote, "New Learning Spaces: Back to the Future" on December 9. Please see our conference brochure in the center of this issue, and visit our Web site for details and online registration.

If you haven't been to the Syllabus Web site recently, be sure to visit soon to check out our new look and updated features (www.syllabus.com). Visit often!

Enjoy this issue of *Syllabus!*

Mary Grush

Letters to the editor should be addressed to the editor and sent to 101 First Street, #605, Los Altos, CA 94022, or via electronic mail (mgrush@syllabus.com). We reserve the right to edit all submissions. **News and product information** will be considered for publication. Please send all materials to Paul McCloskey. If you are interested in writing for *Syllabus,* please send a brief description of your article idea along with writing samples to the editor at the above address.

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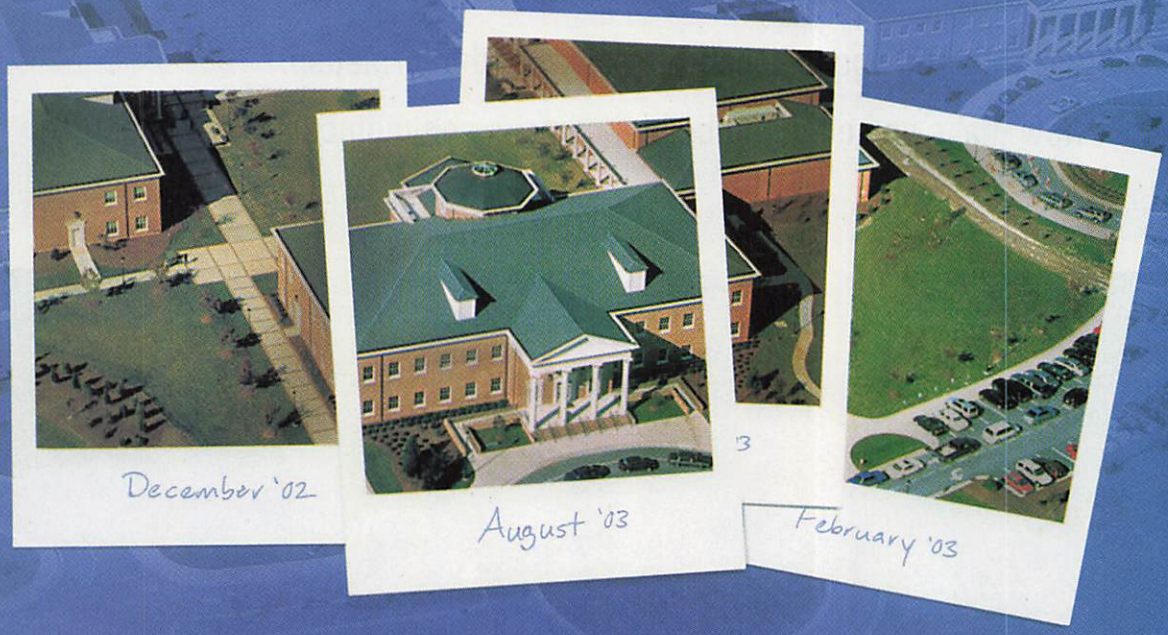

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Phillip D. Long

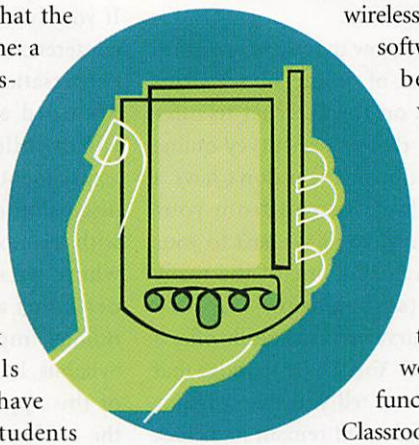
TRENDS

AN INFORMATION RESOURCE OF INTEREST TO EDUCATORS

From eLearning on Handhelds to eSurveys

Just when you think a technology has been surpassed by the next big thing, it sneaks up on you again. For years there have been various attempts to do interesting things with PDAs in the classroom. PDA manufacturers have funded grant programs to seek out creative applications that demonstrate why you should consider using PDAs for your students, or, encouraging or requiring them to make the purchase.

But the general sense is that the value of the PDA is in its name: a digital assistant, doing assistant-like things well, such as keeping track of your schedule, phone numbers and the occasional restaurant look-up in a foreign city.



Committing to a technology in search of applications is generally a high- risk endeavor. Various schools have tried, and the results have been interesting. Medical students at Harvard, for instance, all seem to have PDAs because scheduling time is a critical activity. For them, it's worth the cost, especially given their income potential. For the rest of us, keying in on the 'assistant' attribute also shows some promise. Using PDAs as programmable data collection devices has proven useful (http://www.concord.org/research/handhelds.html).

The trend in classroom interactive tools has been to try to drive the cost of registering the students' responses down, and put the effort into creative question presentation, management, response capture, and interpretation. Classroom response 'clickers' are in the $25 per unit range for a variety of products. The cost is in the special access point and software that is polling it, then processing and presenting the data.

WiFi may be changing all that. eLearning Dynamics Inc. (www.eLearningDynamics.com), in partnership with Wake Forest University, has entered the online course-tool arena with an approach that combines PocketPCs, dynamic interaction, and testing. The entire system is managed from a laptop computer via the enterprise services of an 802.11b wireless network. PocketClassroom software lets the faculty member poll the class with a variety of questions, instantly counting the responses and displaying them for just the instructor, or for the instructor and the students. Careful attention to classroom testing, assessment, and the workflow of handling these functions distinguishes PocketClassroom from many more extensive online learning suites.

Combining secure and confidential messaging with group and threaded discussion tools, all from the PocketPC, lets the instructor engage students in discussion and poll them when desired. Reporting tools for comparing students in the class, across classes, and across academic years is possible. It is unusual for a PocketPC device to enable such a wide suite of student testing options. However, it may give you a clue to know that the company's heritage comes from the entertainment world, measuring responses to test audiences during screenings of Hollywood films.

As the Tablet PC starts to enter the marketplace, is there room for the handheld form factor? The personal device market is highly

BRIEFS

- **A University of Michigan** grad student faces up to five years in prison for hacking into the university's computer system and stealing private usernames and passwords of over 60 students and professors.
- Graphics programs dominated the Top 10 list of software applications sold to the academic market by Dallas-based **Journey Education Marketing Inc.**, with Microsoft Office XP Professional taking the top spot.
- **Washington University** purchased an open architecture Linux-based supercomputer which users say will help it build a community of users of parallel scientific computing.
- **Columbia University** purchased the entire collection of Gale's 18th Century Collections Online, a digital content pool of 150,000 rare English-language and foreign-language books and papers published in Great Britain during the 18th century.

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volatile, so it's difficult to know whether the Tablet offers sufficient teaching and learning support for the price point to capture faculty, student, and institutional attention. Time will tell.

Survey Says—Outsource or Do It Yourself?

When the time comes to administer an online assessment, what do you do? You might develop your own Web page, marry it to a CGI script to have the results e-mailed to you as a text file, and spend time aggregating the results into something you hope will be useful. Alternately, if the survey is to go to a large number of people you might contract with an in-house service if your campus has one, or consider purchasing a testing package. If you're on a campus with a course management system—and increasingly more campuses are investing in these systems—part of that system might administer one flavor or another of assessment.

But did you know that there are other options? A host of online survey firms have emerged on the Internet to offer you either flat rate or per-survey online assessment options. If you don't have a package available to you from your school, or the one you have isn't to your liking, consider using one of the many Web offerings (see box, below).

Do online survey services really offer a valuable service? You'll have to judge that for yourself. I can tell you that a major institution, which shall remain nameless, was, like many, doing online surveys of its faculty. They were using a unit within their university that did good, quality, survey research. But it was primarily a survey that, with the right tools and some effort, might have been done in another way and for a lot less than the $65,000 a year that was being charged. That's exactly what was done. A subscription to an online survey service was taken and the survey transferred to this delivery method. Statistical summaries were obtained, as before, and basic item analysis of the results provided.

But there are drawbacks to this approach. The data returned are from individual surveys and not therefore integrated into any on-going record of either the individual respondents or of a series of assessment instruments. That doesn't prevent someone from building this data set after the fact.

Whether or not you find online Web survey services useful depends on your needs. At the very least you should consider the option of outsourcing if it saves you time and money and provides what you need.

Syllabus2003

If you didn't make it this year's Syllabus conference, you missed a good one. The conversation was engaging, the visit to Stanford exciting, and the sessions worthwhile. This was an interesting 'experiment.' It combined a community discussion about teaching and learning with technology and a visit to a campus where we saw examples of different decisions about teaching with technology implemented. If you attended Syllabus, let me know what you thought of this approach to sharing ideas. Was the conference center plus campus visit a winning combination?

Phil Long, Ph.D. (longpd@mindspring.com) *is senior strategist for the Academic Computing Enterprise at MIT. He is also a senior associate for the TLT Group of the AAHE.*

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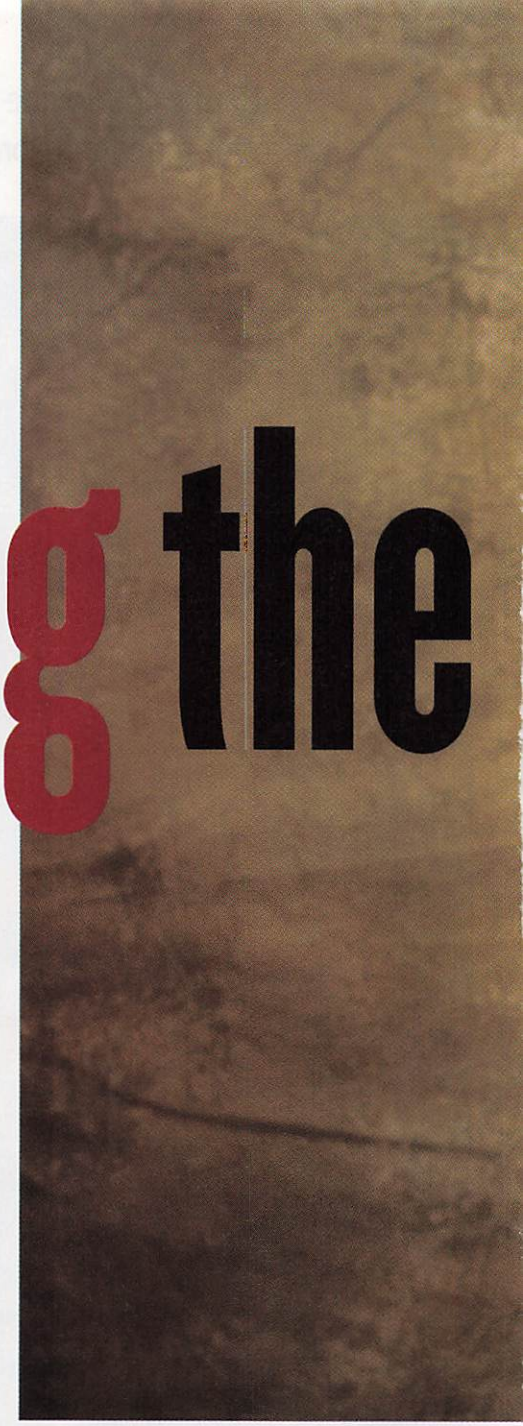
***Syllabus* interviews William J. Mitchell, Dean of MIT's School of Architecture and Planning, about the design of technology-enhanced learning spaces. Active on both academic and research frontiers, Mitchell is also head of the Media Arts and Sciences Program at the MIT Media Lab.**

Designing the



A Conversation with William J. Mitchell

S: I'd like to explore your ideas about learning spaces for higher education—particularly any design changes that we'll see as we move forward with digital technology and new forms of communication that change the way we work and interact.

WJM: I think there's a fundamental change going on right now. Over the last couple of decades there have been a lot of attempts to create high-tech educational spaces that have all sorts of technology built into them, like computers and video projectors—very complex, specialized facilities to support education in various ways. With the emergence of portable wireless technology, that's becoming less and less necessary. What we're starting to see is the emergence of spaces that are designed around human rather than technological needs. The spaces are pleasant and have a nice ambience to them, and you can just use your wireless laptop there or whatever you may need to use; but the space is not built around that because it doesn't have to be. That's a very interesting and exciting development.

S: Do you see collaboration being important to this change?

WJM: Certainly. Two types of collaboration, both synchronous and asynchronous. We're going to see, particularly as greater bandwidth becomes available, more and more use of video conferencing and other collaboration technologies, just as a matter of course, to integrate remote participants into discussions. Incidentally, I see that as much more of an import technology rather than an export technology. There was a lot of interest for quite a while in using video techniques to beam out lectures to wide audiences. I never found that very interesting. What's much more interesting is to bring a remote guest into a seminar, to bring resources into a classroom, to bring collaborators into a process in ways that hadn't been possible in the past. So that's one important part of it. Another important part is just being able to quickly access accumulated online material in context. One of the exciting things I find in seminars now is that students all come in with their wireless laptops, and in the course of the seminar they source in and pull into the conversation material that's relevant to the discussion at hand; and that can be very exciting.

S: And that's something that they could perhaps act on and change dynamically with the media that's available?

WJM: Exactly. All of this comes down to the point that the high-quality education, high-quality learning, face-to-face situations remain enormously important. The architectural settings to struc-

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RICK FRIEDMAN /SABA

ture face-to-face interactions are very, very important indeed, and we can enrich those settings by overlaying them with digital technology.

S: You mentioned collaboration as an import technology with the idea of importing guest lecturers or experts to add to the experience that the students are having. Do you see this also as a way of democratizing education for students in general?

WJM: Yes, very much so. There are all kinds of complicated resource constraints that exist in the educational world that are not educationally beneficial. For example, I frequently teach design studios, and an important component of the design studio is to be able to have eminent architects to act as critics in the studio. The problem with that is that eminent architects have demanding practices that take them to the far corners of the world, and it's very difficult to get them physically in the studio at a particular moment. But if you can establish a remote connection, then it becomes possible to access a whole lot of people and make use of them in ways that simply have been infeasible in the past; so it absolutely expands the availability of human resources. Now I don't mean that as a substitute for the face-to-face; I mean that as an augmentation and a way of expanding the community.

S: How do you assess, when you have designed a space, the degree to which it will be strong or weak in supporting a particular educational process?

WJM: Really the only way you can do it is by observing it over time. It's some-

thing that is actually relatively rarely done just because of the way spaces get made. I think you tend to build them and put them into use and go on to the next thing, and there is not as much systematic evaluation as there should be. But I think one of the really important things is going to be, as new technologies keep moving into learning spaces, to do systematic evaluative work to figure out how they work—not just immediately, but over the long term, because architecture is a long-term thing.

S: Based on your experience, are there some case studies or other sorts of models or information that would suggest that particular kinds of spaces that are good and effective in supporting specific kinds of teaching? Could you point to some outstanding examples at various institutions?

WJM: Let me go back to the point that I began with. I think the spaces that work well over the long term are spaces that are built around very fundamental human needs like comfort, natural light, operable windows, good social ambience, nice spatial quality, views out the window. All these sorts of things are immensely important, and because people don't change very much, those things remain important. If you build space around specific technology, it very rapidly becomes obsolete because technology changes very quickly, and it's also the wrong priority. You really want to build space around the people rather than technology. We've seen it with computer technology. It's very interesting if you look back over several decades. It used to be that spaces for engagement with computers were very much dominated by the needs of the computers—specialized computer rooms and computer labs that had lighting conditions and air conditioning and so on—really those spaces were aimed towards the care and feeding of the computer, and people in the space just had to tolerate that. Then with personal computers, machines became more robust and more distributed into everyday working environments, but they were still at fixed locations and so you got stuck in your cubicle like Dilbert because you had to work with your machine. Now what's happening is, as technology becomes more portable and robust, and much less demanding in its environmental requirements, you don't build a space around a laptop; you just take a laptop to a space where you like to be.

S: Does that make the design of the spaces less challenging then?

WJM: No, it makes it actually more challenging, because the hardest thing is to make good humane spaces that people are excited to be in and stimulated by and that really support their work. It's fairly easy actually to design a space that meets very specific technical requirements and take that as a kind of excuse for not addressing other architectural issues. It's actually much tougher to focus on the fundamentals of architecture.

S: If you were designing a teaching space today, would there be any design strategies that you would be especially enthusiastic about or any that you would be careful to avoid?

WJM: I've said the rigidity of building space around particularly technologies is certainly to be avoided. Then design strategies of as much flexibility as possible, as much accommodation of unexpected interactions and learning strategies as possible is really what you want to go for.

S: Is there an example of some of that flexibility that you could give me?

WJM: Let me give you an example from the design studios of MIT, which is pretty close to home, and I've been observing them very closely as they've evolved over the last few years. A few years back when we did some big renovations, we of course wired up the studio and provided networking at every student desk and power supply at every student desk, and that turned out to be an effective thing for its time. We put a lot of desktop computers into the studio. That worked pretty well, but it did have the disadvantage that if you wanted to look at student work you had to go to their computer. At the same time we also put in a little café right in the heart of the studio space with lots of café tables. What we see these days is a huge amount of the real learning action is actually taking place at the café tables rather than what's formally designated as workspace. Students sit there, have discussions; they have their portable technology with them so they're not disconnected when they go to those locations. So there's really been a very powerful shift from these kinds of highly specialized, fairly rigidly organized spaces to ad hoc grouping and much more flexible space use in spaces that you would not even have thought of as workspace before.

S: You say that the students seem to sort of gravitate towards that café space. Do you suppose that's because of the novelty or because that particular architect hit on something that works?

WJM: Well, it's a nice space to be, and people do tend to vote with their feet and gravitate to nice spaces if they don't have something constraining them to somewhere else. There's always the possibility of novelty effect, but that's why you have to look at spaces to see what happens over the long term.

S: In the facilities planning process at higher education institutions, who would ideally be included in the input? And in reality, who would normally be included? In other words, is there adequate and appropriate outreach to the ultimate users of these spaces?

You really can't separate the issues of technology and the space that accommodates it at this point—you have to think of the two of them together.

WJM: It varies enormously from project to project and from institution to institution, but I think in general there's probably not enough direct engagement of the end users, particularly the student end users, in the process. It's challenging to structure a process that really accomplishes that. Also, you have to keep in mind that students are a relatively transient population and administrators and faculty members have to be able to deal with the situation over the long term. Nonetheless, I think real effort at much more serious engagement of the end users is always a good thing to do and something that is often neglected. The other thing I'd say is that at this point you really have to put architects and technology people together at the very beginning of the process. They have to really interact with each other so that each group understands what the other has to say. You really can't separate the issues of technology and the space that accommodates it at this point—you have to think of the two of them together.

S: Are academic institutions as a rule really all that much ahead of the curve in terms of anticipating future needs for instructional spaces?

WJM: No, I'd say they often tend to be very conservative and relatively unimaginative about these things.

S: What could they do better? What kind of advice could they take from you in terms of planning a little better?

WJM: I think you have to do experiments. We're in a period of extremely rapid change. It's easy enough to speculate about what might work, but there's a difference between speculation and evidence. I think is extremely important for academic institutions to do, wherever they can, lots of small-scale, adventurous experiments and really monitor the results and try to build up a reliable experience base rather than depend on preconceptions and prejudices.

S: Do you think campuses are in fact likely settings for these kinds of experiments? You'd think that the environment of education would be just absolutely the prime kind of place to experiment. Do you think that's the reality of it, or do you think campuses are going to continue to be conservative?

WJM: I must say, there has been a lot of experimentation at MIT in the last few years, and I think that's the right direction. We have learned a lot from the experimentation, and I think we're not alone in that. So yes, some campuses are beginning to experiment. But there's a factor that works against it—buildings are expensive. People want to minimize risk in construction projects and so may get organized in a very bureaucratic way. It's risk minimization rather than experimentation. That's in fact very shortsighted, and it really is important to be more adventurous and experimental.

S: Do you think wireless technologies are going to lessen the risk because you may not have to lay wired connections?

WJM: We're always going to have a combination of wired and wireless infrastructure. As you know, what wireless really does is to connect you to the nearest point of fixed infrastructure, and the fixed infrastructure usually takes it from there, so the wired infrastructure in fact doesn't go away. And wired infrastructure is always going to be more reliable. I think the need to accommodate wired infrastructure and to invest in it and to provide things like wiring closets and conduits and network drops and all of those sorts of things, that's not going to go away. Wireless is not a substitute for that. What it does is provide flexibility in space use on top of that, to remove some of the rigidities in space use, but I don't think it really reduces very much the need to invest in a basic wired infrastructure.

S: In general, are campus learning spaces now being designed more for multiple uses, and do you see an effort to serve a range of instructional formats, especially in the light of technology-enabled classrooms?

WJM: It's hard to generalize but yes, I think there's a growing realization that flexibility is important, that the new technologies allow much more flexibility, and yes, one ought to try to take advantage of that.

Technology is going to become simultaneously more sophisticated, less obtrusive, and less visible...

S: What changes will we see in learning spaces on campuses in the future? How will new forms of digital communication, interaction, and information delivery impact choices about the design of physical spaces?

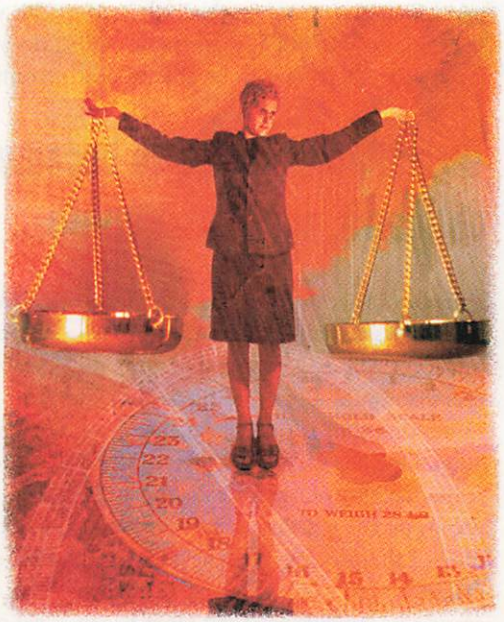
WJM: Technology is going to become simultaneously more sophisticated, less obtrusive, and less visible. It's going to kind of disappear into the woodwork and into very unobtrusive portable devices. Actually I think what we're going to see is not a kind of scenario of very fancy specialized high-tech instructional spaces. Quite the opposite, we'll see spaces becoming more and more simple in a way, human-oriented. We'll see things like outdoor space, in the right climates anyway, much more utilized. If you can get wireless reception outside under a tree on a nice day, there isn't any great reason to be in the classroom anymore. I think it'll be the amazing disappearing technology basically, so it'll be omnipresent and supporting learning activities in a very flexible kind of way, but it won't be dominant and it won't be highly visible.

S: Do you see any particular technologies being really key? I know you're talking about technologies being so integrated into what we do that they tend to be invisible, but are there any that will in fact stand out that will be important to everyone?

continued on page 41

David G. Brown

FACULTY PRACTICE



Leveraging Technology for Learning

When strawberries are inexpensive and available, the creative chef delights with strawberry-based recipes. Likewise, this is the era of technology, increasingly inexpensive and available; technology is in season. Our students expect us to use it.

How can we respond responsibly? How can we take advantage of students' expectations and avoid using technology for its own sake? One approach is to ask, "what can technology facilitate that was before more difficult, more onerous, or more expensive?" Then we can ask, "What changes derived from these practices will increase the quality of learning?" Below are five areas where I have found technology to be an unusually effective tool.

First, I can provide students with a broader view. When a tax cut is in the news, I can point them toward columnists representing both pro and con. Their rough draft work can be critiqued by practitioners. Exercises developed by an economist colleague at another university can be used. Student papers from previous terms can be made available. In short, I can escape the role of being their only authority.

Second, I can individualize assignments and advice. Pre-med students can study the supply and demand of organs for transplant. Theatre majors may study the same topic by analyzing Broadway ticket pricing policy. Perhaps even more importantly, I can answer questions that may be unique to a single student without taking the time of an entire class. I can focus my probing questions at the core of their confusion. I can more easily find time for each student, and let them know I care about them as an individual.

Third, students can be asked to do more on their own. I can insist that each student respond to a probing question. I can expect students to connect with professionals in the field. I can have a student-manager-of-the-week summarize the concerns of other students. I can expect term papers to include a treatment of the subject in both text and picture. Students can be expected to archive copies of their papers and routinely consult an ever-changing syllabus, to help with course administrivia.

Fourth, it is much more realistic to expect students to collaborate on assignments, to teach each other the material. They can more easily connect, even when separated by time and place. I can more easily observe the contribution of each individual, as well as the final result of the group work. The management and monitoring of study groups is more feasible. Interaction between myself and these students teams can become the norm.

Finally, my materials can be more timely. Weather data can be today's weather. Economic issues can be today's news. Even in the midst of a class session, the resources are available to support an unexpected turn in the discussion.

As many other professors find slightly different but equally compelling ways that technology supports learning, it should be no surprise that students are expecting more technology. No wonder that almost no professor who once incorporates technology into teaching, later abandons it. We have more options and we're using them.

David Brown (brown@wfu.edu) is vice president and dean of the International Center for Computer Enhanced Learning at Wake Forest University.

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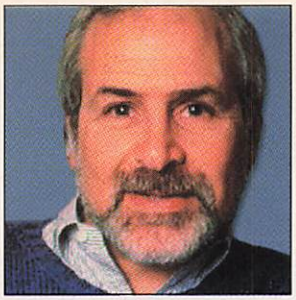

Kenneth C. Green

DIGITAL TWEED

Command, Control, and Curriculum

Between 1943 and 1961, Dwight David Eisenhower had five jobs: Supreme Commander of the Allied Forces in Europe (1943-45), Army Chief of Staff (1945-48), Supreme Commander of NATO forces (1950-1952), and president and commander in chief of the United States (1953-61). He also served, briefly, as president of Columbia University (1948-50).

One story about Ike's months at Columbia highlights the difference between academic and military organizations: walking across the campus with the provost just prior to assuming the Columbia presidency, the provost was briefing the General about an important issue on which the faculty and administration had differing opinions. Eisenhower, ever the military man, commented that the University should simply tell the faculty what to do. The provost responded, "General, the faculty *are* the university."

Generals enjoy command and control; college presidents suggest, encourage, and cajole.

The Eisenhower story comes to mind as we enter the third decade of the so-called "computer revolution in higher education." In January, 1984, concurrent with Apple's launch of the Macintosh, a small number of colleges and universities began the first computer resale programs as a way to provide discounted microcomputers to students and faculty.

Campus officials viewed the resale programs as an extension of the instructional mission of their institutions—providing students with access to technology.

This new link between instructional mission and information technology manifested itself in other ways. For example, during the mid-1980s, colleges and universities, along with Apple and IBM, encouraged faculty to create courseware—sometimes simple/sometimes sophisticated homegrown curricular resources designed for "microcomputers."

The excitement of the times and technology is reflected in a 1984 Drexel University documentary, "Going National: The Drexel Microcomputer Project." We see Drexel students, faculty, and administrators getting their new computers, learning to use a Mac, using computers in class and for course assignments, and talking about their great aspirations for the role of computers and information technology as part of the college experience.

Two decades later, what hath we wrought? Without question, the technology that was new and unique in 1984 has become ubiquitous. Twenty years ago students came to campus to learn about computers; today students come to campus (and to online courses) *to learn about* and to *learn with* technology.

And yet, there is continuing concern about the disappointing levels of instructional integration. The 2002 Campus Computing Survey reveals that senior campus IT officials continue to identity the "instructional integration of information technology" as the "single most important technology issue" confronting their institution over the next two-to-three years. Moreover, less than a fifth of institutions participating in the 2002 survey report that their campuses consider faculty IT efforts as part of review and promotion.

Even as institutions spend increasingly difficult dollars to license course management systems, upgrade labs, install wireless networks, provide faculty training and support, and create presentation classrooms, campus and conference conversations suggest that many senior officials feel their institution is not progressing: "Maybe a third or 40 percent, maybe even half of our faculty are doing something with technology in their courses. But we seem stuck, as the

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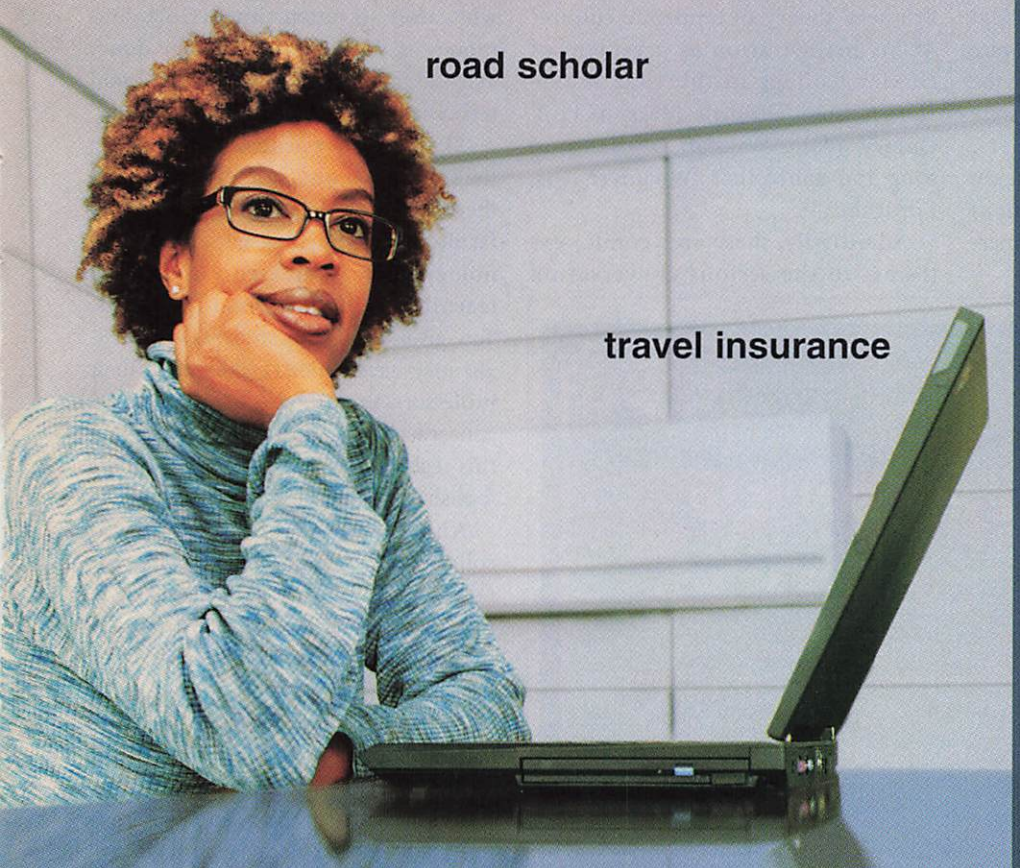

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numbers have not been rising the past two-to-three years."

Is this simply a matter of biblical metaphors? An old joke in the software industry notes that God could create the world in seven days because there were no legacy systems or legacy users. Clearly we've spent far more than seven years (and some multiple of $7 billion) to build the IT infrastructure for American colleges and universities.

Or does the too-slow migration of IT into the syllabus reflect the Marx Brothers' theory of academic culture? At his inauguration as president of Huxley College in the 1932 movie *Horsefeathers*, Groucho Marx, as Prof. Quincy Adams Wagstaff, proclaims in song and dance that "Whatever it is, I'm against it."

Admittedly, these are (comic) extremes in the serious conversation about technology and instructional integration. But the questions linger: why, after so much time, effort, and money, is there still much to be done? Why do many faculty continue to avoid technology as an instructional resource?

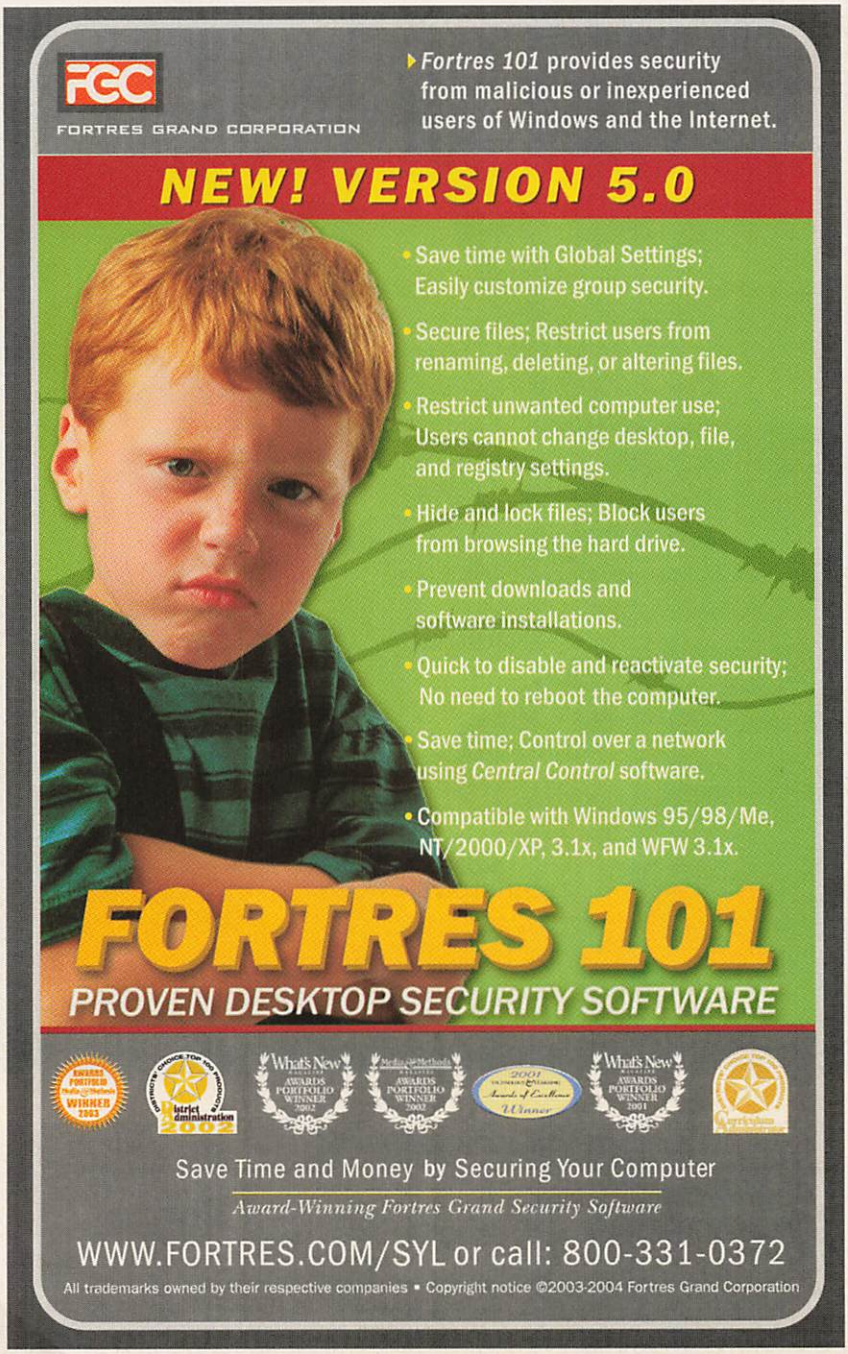
The core infrastructure is in place; the student interest (read expectation) is there. But what seems missing for many faculty is a compelling sense that technology makes a difference in student learning and educational outcomes. Too, given that many students (aged 18-68) may have better IT skills than their professors, there is also the professorial concern about "How do I do this—use this technology stuff—without looking foolish in front of my students?"

Ah, it would all be so simple if college presidents and provosts had the power and authority of generals: send the troops (faculty) to training, give them the resources, and set hard deadlines for implementation.

Yet, as Eisenhower learned from his provost, faculty *are* the university. The atoms of academic organizations are individual professors who operate as free agents rather than as employees of the university.

In the closing chapter of *War and Peace*, Tolstoy reminds us, "For a command to be carried out to the letter, it has to be a command actually capable of fulfillment." From "user-friendly DOS" to the Web and beyond, an important lesson of the past two decades has been that infrastructure, not just technology, fosters adaptation and innovation. More than just "Build it and they will come," curricular deployment and technology integration also depend on sustained support and some significant nurturing to attain "fulfillment,"to experience broader instructional intergration.

***Casey Green, Ph.D. (cgreen@campuscomputing.net)**, founding director of The Campus Computing Project (www. campuscomputing.net), is a visiting scholar at The Claremont Graduate University and a visiting professor at Case Western Reserve University.*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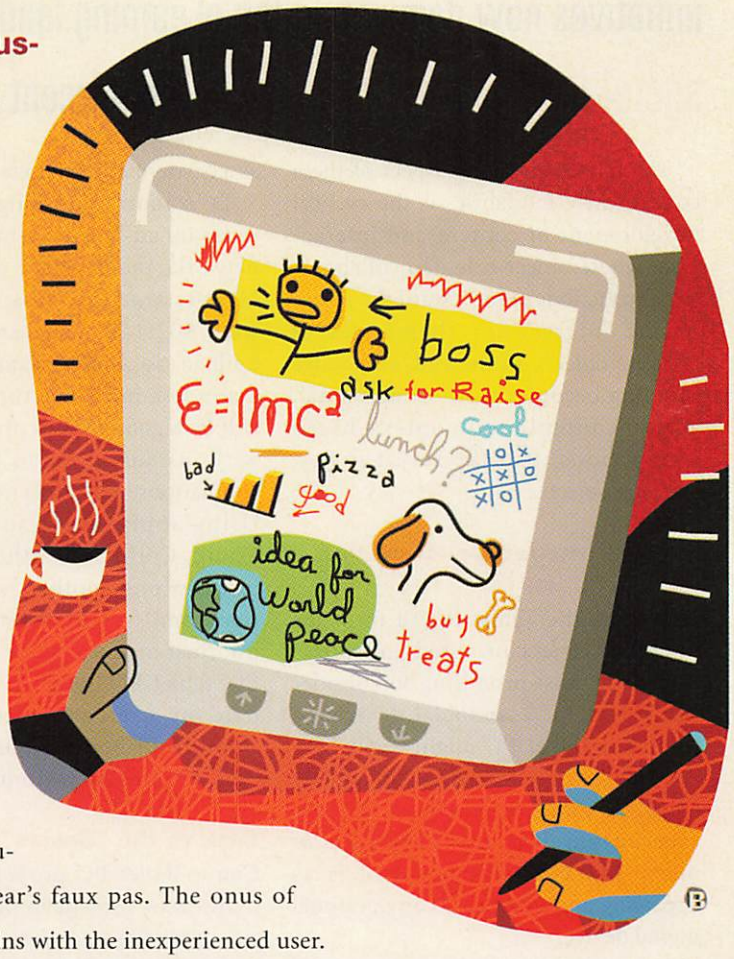
Learning with Tablet PCs:

True Learning Tools or Trendy Devices?

Cyprien Lomas and Ulrich Rauch,
University of British Columbia

Tablet PCs have arrived on our campuses: appealing, lightweight devices that have all the features of laptops plus the option of pen-based or keyboard entry. But even with their obvious potential for mobile computing applications, their best uses in classrooms are yet to be defined.



In the accelerating upward spiral of eLearning technology, great effort has been made to lead the somewhat confused user to a golden land of personal computing. Recent developments such as portals, learning objects, and ePortfolios have been offered to make information more accessible.

However, these technologies also require a sophisticated and knowledgeable user base and a will to engage. New monolithic projects pop up with the regularity of Paris fashion shows; last year's fad is this year's faux pas. The onus of finding the right fit for emerging technology often remains with the inexperienced user.

A similar trend is occurring in the classroom. With electronic delivery of media allowing rapid delivery of extensive—maybe too much—material, special value is being placed on the assemblage of knowledge through social interactions. Successful students interact with one

Illustrated by Mark Betcher

another and the media to master a subject. Now, the social and collaborative aspects of education are being recognized as more important than the simple consumption of educational materials.

Thus, there is a dynamic relationship between content and interaction. Currently, widely used tools such as e-mail, discussion boards, and chat rooms can be seen as examples of the increasing need and opportunity for collaborative interaction in a classroom setting. While most students are adept at such tools, applying them in an academic situation requires careful design and experienced coaching.

ments reminiscent of schoolyards and chalkboards. The Tablet is a return to the basics of intuitive computing, where 'the basics' has been elevated by the dialectical mixing of rich content and rich interaction.

A Tablet's primary input is pen-based. Tablet PCs allow the user to input data in the manner that they are most comfortable with. Data can be entered as symbols, lines, and scribbles. Alternately, the user can revert to the keyboard. The Tablet's shape and profile allow for easy passing and sharing among peers. Unlike laptops, the screen is less individualized and does not serve as a barrier between users.

dialogue toward an emphasis on learning within social structures and processes that are supported but not dominated by technology.

In an environment where facts can be instantly verified, teaching value shifts from 'knowing' to processing. Much of the promise of the Tablet PC rests in its potential to support the creation of adhoc communities, where a given task is jointly processed. Rather than teaching facts, an emphasis can be placed on teaching inquiry within a discipline. In the classroom or beyond, communities can then spring up effortlessly, allowing the sharing of research, data, and the collection of data and collaboration between students.

The Tablet PC is at the perfect juxtaposition of the monolithic technology initiatives now dominating the eLearning landscape and the spontaneous, playful, social learning environments reminiscent of schoolyards and chalkboards.

The most fascinating aspect of these collaborative modalities is the cyclical development of content and interaction, where object-oriented collaborative interactions point toward the re-use of the interactions themselves as learning objects. In the end, knowledge building becomes three-dimensional, across-content, and content-based interactions, and the result is new learning objects.

Object-Oriented Collaboration and the Tablet PC

How does the Tablet PC fit into this model of object-oriented collaboration? It is most promising to consider the Tablet PC as a social device. In itself, the Tablet PC might easily be a candidate for a fad. It is not widely available and everybody wants one, even unseen. It is the culmination of many years of research and is as appealing and portable as any personal digital device.

Yet the Tablet PC is at the perfect juxtaposition of the monolithic technology initiatives now dominating the eLearning landscape and the spontaneous, playful, social learning environ-

Even more promising is the ability to set up ad-hoc, peer-to-peer wireless networks independent of the existing IT infrastructure. Most Tablets come with 802.11b wireless capabilities built-in. So as more campuses develop a wireless infrastructure, Tablet PCs will be a good tool to provide students with instant access to facts, figures, simulations, and other course content. Using applications such as Silicon Chalk, Colligo, or others, users can discover one another, set up connections, and start to communicate in an informal manner. These features make the Tablet PC the number one candidate for a return to the small-scale, simple, collaborative, 'back-to-basics'-type of learning environment.

Back to the "Basics"

Can a Tablet PC properly reflect the richness of content in object repositories, ePortfolios, and in simulations of reality? The real strength of the Tablet is seen when it encourages users to explore unmediated, peer-to-peer forms of communication. This signals a move away from learning via pure

In this context the Tablet PC has two roles: It streamlines processes like data creation and presentation through its easy-to-use stylus and its intuitive interface. But it also presents itself as collaborative tool, connecting to the human and technical network alike.

In the first role, it is a workable platform or outlet for the built-up eLearning infrastructures of the past several years. But in its second role, it promises new approaches to technology in learning. Social interactions and group processes may supplant technology as the gateway to knowledge. This will lift the Tablet PC and its applications from the level of a fad into the ranks of a 'true blue' learning tool.

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Ulrich Rauch, Ph.D. *(ulrich.rauch@ubc.ca) is the director in Arts Instructional Support and Information Technology at the University of British Columbia.*

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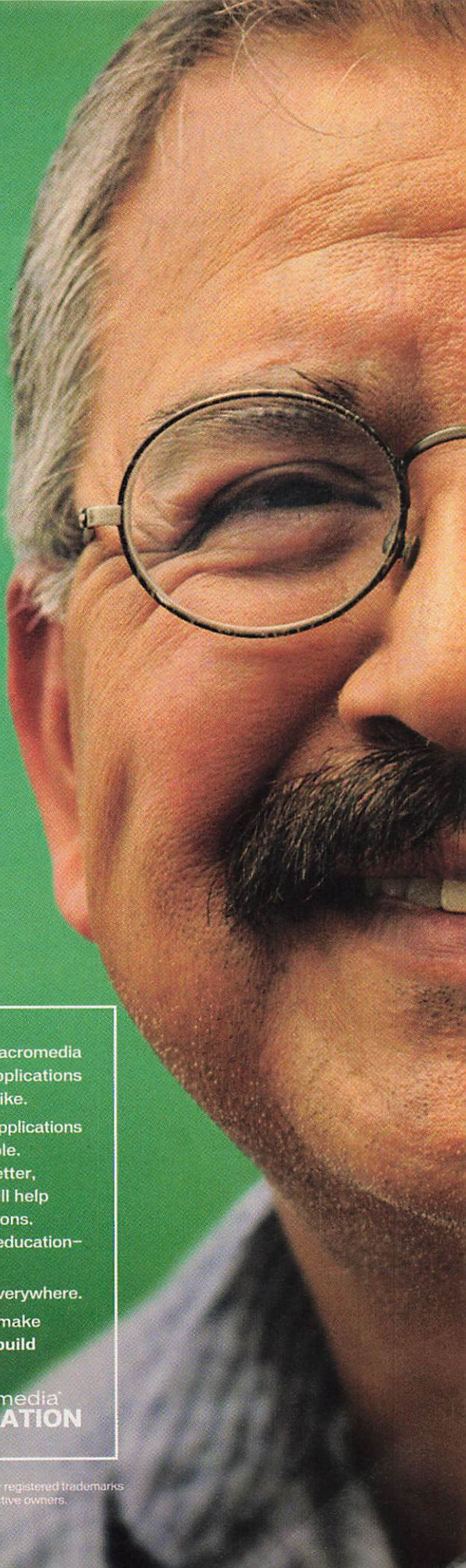

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PUTTING CHEMISTRY IN THE PALM OF YOUR HAND

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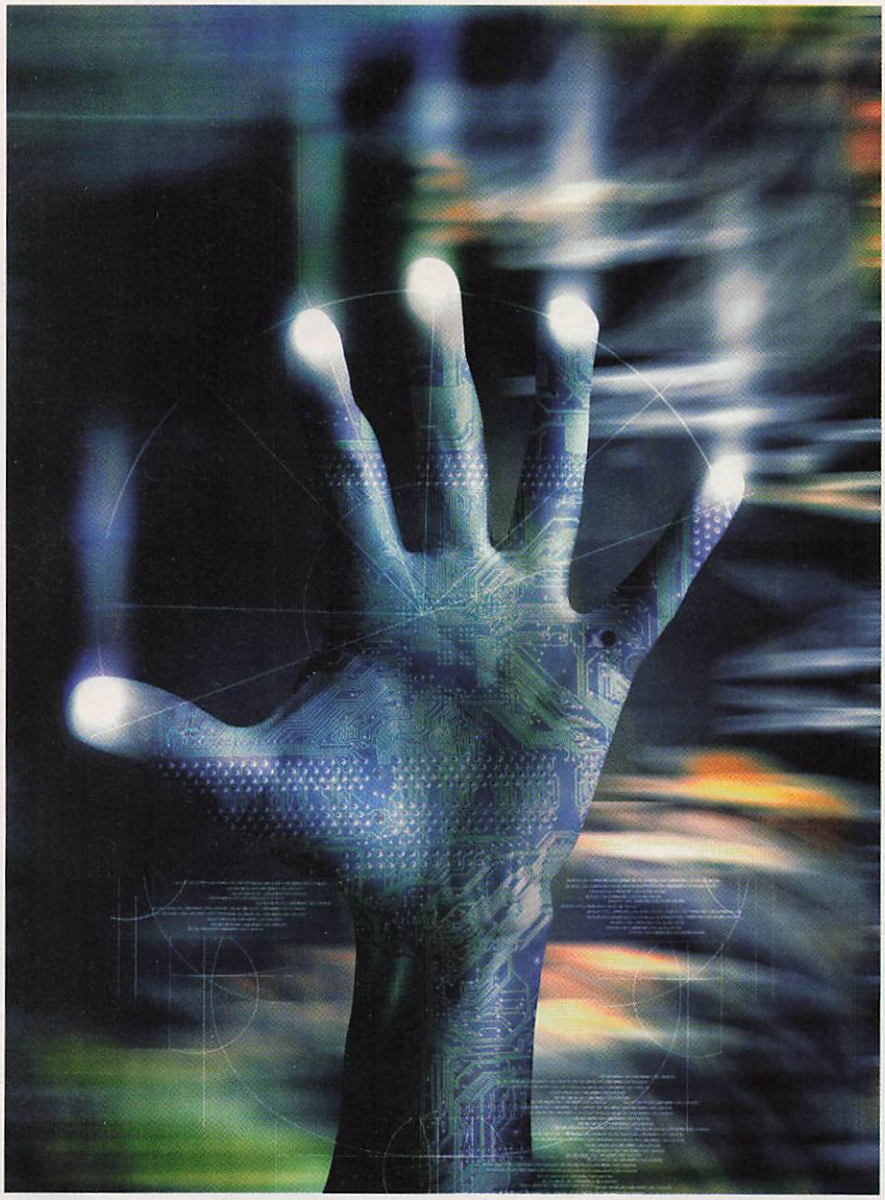

The advent of easily accessible computer technology has had a great impact upon science and science teaching. Its ubiquitous presence in science labs is a fact of life, and students now have many opportunities to use computers for the interpretation and discrimination of data. What has been overlooked so far is the means of the acquisition of data.

A revolution has resulted from advances in technology and the analog/digital conversion of data streams. The ability to acquire data directly from sensors that measure physical properties, such as temperature, pressure, pH, and conductivity, over timeframes that range from fractions of a second to hours, days, or weeks, is now a critical part of the process of science.

If we fail to give our students exposure to this part of the scientific method, we do them a grave disservice.

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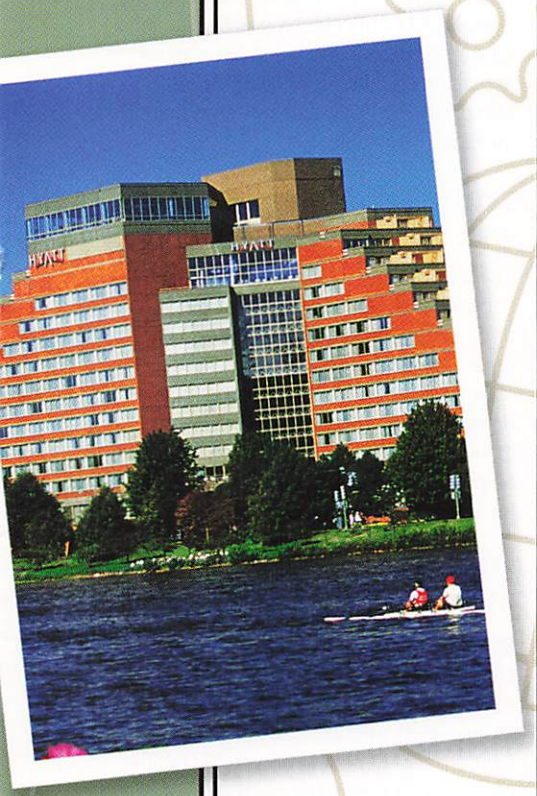

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Syllabus Overview

Syllabus Conferences are tailored to the needs of faculty, administrators and IT professionals in higher education. The focus is on technologies of strategic interest to the mission of higher education, whether in the classroom or campuswide. Each conference provides a collegial environment in which attendees can exchange experiences and network with other attendees, as well as discover the latest in technology products, services and applications. All computer platforms, software types, presentation devices, quantitative tools and technologies are explored. Keynote speakers, presenters and panel members are technology leaders in higher education and reflect the editorial integrity and superior content of *Syllabus* magazine.

Who Should Attend

Syllabus fall2003 offers keynotes, seminars, breakout sessions, poster sessions, vendor access and peer networking activities geared to a broad spectrum of higher education professionals:

- CIOs, Provosts, VPs, and IT Directors involved in strategic and enterprise-level technology decision making
- Directors of Academic Computing who want to implement systems that will foster the highest academic standards and practices
- IT professionals who must maintain mission-critical applications on campus
- Heads of administrative computing departments who provide key information services throughout the campus
- Faculty who want to take advantage of the latest technology for teaching and learning
- Department chairs interested in providing faculty development opportunities

Conference Tracks

New Technologies and Trends

From handheld computers to tablet PCs, ePortfolios, and new high-tech tools for instruction, this track samples the new and emerging technologies and applications that are sure to make a difference in the development and delivery of education.

Interactive Media

Today's interactive media are allowing educators the flexibility to offer new modes of teaching and collaborative learning. See how these technologies are being used in the classroom, the lab, and for distance education, and learn more about the enabling technologies and standards like SMIL and XML that help to make it all possible

IT Implementation and Support

Evaluation and support strategies are central to the success of ePortfolio initiatives, distance learning programs, and other implementations of technology on campus. Find out what institutions are doing to support faculty development, evaluate technology programs, provide help desk services, and offer resources for technology integration.

Strategic Planning/ Administrative Issues

Strategic planning may involve a myriad of challenges, from infrastructure issues, to accreditation of distance learning programs, to section 508 compliance. Concerns may include how to determine return on technology investment, or how to leverage technology to benefit large non-major sections.

Teaching with Technology

This track offers a faculty view of the intersection of technology and pedagogy. Join colleagues as they present case studies in their disciplines and explore relevant topics, including instructional design standards, academic integrity, technology and student learning, and more.

Conference Welcome and Keynote

New Learning Spaces: Back to the Future

Tuesday, December 9 • 8:30 – 9:45am

William J. Mitchell – Dean, MIT School of Architecture and Planning and Head of the Media Arts and Sciences Program, MIT Media Laboratory

Over the last decade or so, many colleges and universities have built specialized, high-tech labs and classrooms that provide and showcase the latest in learning technology. In this presentation, Dean Mitchell will argue that this is precisely the wrong strategy, propose an alternative, and illustrate this alternative with practical examples. As digital technology becomes ubiquitous, it can disappear into the woodwork. Without sacrificing connectivity or functionality, learning spaces can now be built around responding to basic human needs rather than responding to the requirements of specialized and delicate machines.

William Mitchell holds degrees from Melbourne, Yale, and Cambridge Universities, and is a Fellow of the Royal Australian Institute of Architects and the American Academy of Arts and Sciences. He is the author of four books and writes a monthly column for the Royal Institute of British Architects Journal. *He recently chaired the National Academies of Science and Engineering committee on Information Technology and Creativity, which produced the report* Beyond Productivity.

Wednesday Keynote

A Conversation About Higher Education and IT

Wednesday, December 10 • 8:30 – 9:45am

Graham Spanier, Ph.D. – President, Penn State University

Graham Spanier will offer his perspective of technology integration at a major research and teaching university. A true technology president, Dr. Spanier has guided Penn State through eight years of far-reaching technology change on campus, including the establishment of Penn State World Campus, the university's distance education initiative, and a new School of Information Sciences and Technology. He will discuss trends connecting education and IT, issues surrounding the management of information technology in higher education, and how to use IT to create more student-centered universities.

Dr. Spanier, a distinguished researcher and scholar, has written more than 100 scholarly publications, including 10 books. He earned his Ph.D. in sociology from Northwestern University, where he was a Woodrow Wilson Fellow, and his bachelor's and master's degrees from Iowa State University. A national leader in higher education, Dr. Spanier currently serves on the Board of Directors of numerous national associations; chairs the National Association of State Universities and Land-Grant Colleges, and the Big Ten Conference Council of Presidents/Chancellors, and vice-chairs the Worldwide Universities Network.

Luncheon Keynote

Teaching and Learning Technologies in the Year 2015

Wednesday, December 10 • 12:30 – 1:45pm

Howard Strauss – Manager of Technology Strategy and Outreach, Princeton University

Howard Strauss will explore some current technology trends and project their implications for colleges and universities. By pondering the future of authentication, portals, course management systems, and smart classrooms, you'll be better prepared for the next big things in technology.

Howard Strauss is the manager of technology strategy and outreach at Princeton University. Previously, he was manager of Advanced Applications, an advanced technology group charged with turning the latest information technology into practical applications. He and his group created PNN, one of the first campus-wide information systems, a precursor to Gopher and the World Wide Web. He is a graduate of Drexel University and Carnegie Mellon University and has worked at the Johnson Space Center of NASA and at Bell Telephone Laboratories.

General Session Panel

Knowledge Transactions: Digital Technologies and Change

Monday, December 8 • 4:15 – 5:30pm

Blogging, ePortfolios, and learning objects are among the technologies indicating changes in the way information is created, managed, and exchanged on campus. How will digital technology change basic knowledge transactions for higher education?

Moderator:

Frank Tansey, Ph.D. – Student Friendly Services

Panelists:

Trent Batson – Director, Information and Instructional Technology Service, University of Rhode Island

Steven R. Acker, Ph.D. – Director, Learning Technologies Research and Innovation (TELR/CIO), and Associate Professor of Journalism and Communication, The Ohio State University

Sarah Roberts – IT Analyst and Supervisor, Multimedia Project Studio, Office of Information Technology, Duke University

Conference-at-a-Glance

BREAKOUT TRACKS	New Technologies and Trends	Interactive Media	IT Implementation and Support	Strategic Planning/ Administrative Issues	Teaching with Technology

Monday, December 8, 2003

8:30am

M1 XML in Education

M2 An Introduction to Macromedia Flash MX

M3 IT Training & Certification Success in Academia

M4 Taking the Entire Campus Wireless: How and Why

M5 Instructional Design in the Web Space (Part 1)

10:00am
10:15am

M6 Transitioning from WebCT to Blackboard

M7 Security 101 for a Small School

11:30am

Poster Sessions

12:30pm
1:00pm

M8 Tablet PC Pilot at Seton Hall University

M9 Teaching with Technology: Bringing the Immigrants Over

M10 Increasing Institutional Productivity with a Technology Enabled Faculty

M11 Ahead of the Curve – International Video Webcast and Discussion

M5 (continued) Instructional Design in the Web Space (Part 2)

2:30pm
2:45pm

M12 Taking the Entire Campus to Voice-over-IP: How and Why

M13 Critical Thinking through Multi-media and Media Literacy

M14 Campus Computing 2003

4:00pm
4:15pm

General Session Panel: "Knowledge Transactions: Digital Technologies and Change" Moderator: Frank Tansey, Ph.D. – Student Friendly Services

5:30pm

12:00 - 1:00pm Lunch Break

Tuesday, December 9, 2003

8:30am

Keynote: "New Learning Spaces: Back to the Future" William J. Mitchell – MIT

9:45am
10:00am

T1 Make It Truly Online-Create E-Textbooks for Online Courses

T2 An Interactive Reference Desk: Lessons Learned

T3 Visual Understanding Environment

T4 Strategy that "Sticks"—Lessons from Tufts' IT Incubator

T5 Student Resources for Faculty Support – Panel Session

11:00am
11:15am

T6 Facilities Planning for Instruction: A Call for 'Intelligent' Classrooms

T7 Online Courses / Student Experience – Panel Session

T8 Rethinking Doctoral Education

T9 Universal Access and Assistive Technology – Panel Session

T10 Teaching Research and Information Technology Fluency

12:15pm
1:15pm

Poster Sessions

2:15pm
2:30pm

T11 e-Portfolio Implementations – Panel Session

T12 Building Strong Writers Through Interactive Web-Based Tutorial

T13 Outsourcing: Panacea or Pandora's Box?

T14 Adjunct Faculty… Missing Links in the Educational Chain

T15 Online Instructions / Engineering – Panel Session

3:15pm
4:00pm

T16 Using Webcams and BlackBoard to Create a Virtual Classroom

T17 OnlineDiscussion – Panel Session

T18 Using Digital Tools in Study Abroad Programs

T19 How to Avoid Liability and Bandwidth Consumption and Prevent Cyber Attacks

T20 Designing a Hybrid Early Intervention Certificate Program

5:00pm

12:15 - 2:15pm Exhibit Hall Open
12:15 - 1:15pm Lunch in Exhibit Hall
3:15 - 4:00pm Exhibit Hall Open - Snack Break
5:00 - 6:30pm Exhibitor Reception

Wednesday, December 10, 2003

8:30am

Keynote: "A Conversation About Higher Education and IT" Graham Spanier, Ph.D. – Pennsylvania State University

9:45am
10:00am

W1 The Effect of Integration of PDAs into an Engineering Course

W2 Creating "Business Grade" Learning Environments

W3 Meeting the Campus Mission: Access to Education

W4 Student Advising Online – Panel Session

W5 Assessing Student IT Skills in a Game Environment

11:00am
11:15am

W6 Raising the Level of Interactivity in an Online English Composition Class

W7 Comparison of FlashCom and WebCT Technologies

W8 Ending the Debate on Off-the-Shelf vs. Custom

W9 Portal Implementations – Panel Session

W10 Dynamic Online Instruction – Panel Session

12:15pm
12:30pm

Luncheon Keynote: "Teaching and Learning Technologies in the Year 2015" Howard Strauss – Princeton University

1:45pm
2:00pm

W11 Development of Web-based Groupware for Assisting Language Teaching

W12 Student / Faculty Communication – Panel Session

W13 Implementing a Web Content Management Solution

W14 Implementation Strategies – Panel Session

W15 Strengthening the Clinical Social Work Curriculum

3:30pm

Syllabus fall2003

M1 XML in Education

Monday, December 8
8:30 – 11:30am
Half day

Frank Coyle, Ph.D. – Director, Software Engineering Program, Southern Methodist University

For educators, XML standards are playing an increasingly important role in both content delivery and infrastructure management. Many software packages use XML to structure and move data between applications; XML vocabularies such as SMIL and SVG are opening up new ways of preparing multimedia content. School systems are using XML to authorize access to transcripts. And the US Department of Education is using XML for a common origination and disbursement record for Direct Loans and Pell Grants. As these initiatives continue to proliferate, it is imperative that educators understand what XML is and how they can best leverage it to meet their specific needs.

In this session we'll explore the origins and structure of XML and the family of support technologies that make applications possible. We'll look at how Cascading Style Sheets (CSS), XHTML, SVG, and VoiceXML open up options for delivering XML to a variety of devices in different formats. We'll also contrast and compare DTDs and XML Schema, two options for specifying document form and content, and explore new developments in XML support technology including a look at the W3C's XSLT, XPath, XLink and XQuery initiatives. The session will wrap up with a look at SMIL, the Synchronized Multimedia Integration Language that brings sophisticated multimedia presentations into the hands of educators. Attendees will come away with a broad perspective of how XML-related standards work together to enable the delivery of real-world XML-based applications.

M2 An Introduction to Macromedia Flash MX

Monday, December 8
8:30 – 11:30am
Half day

Tom Hall – Trainer, Software Developer and Consultant

Macromedia Flash MX, the latest release of Flash, is the solution for developing highly visual interactive content and applications for the Web. This tool provides one of the quickest ways of adding animation to a Web page but also can be used to create very high quality Web content. This seminar will provide the following: Product Overview, Product Resources, Product Showcase, and a behind-the-scenes look at how to use Flash MX. You will be taken behind the scenes to learn about the Flash development environment and be shown how to create a variety of different animations using Flash MX. You also will be introduced to ActionScript, the powerful programming environment available in Flash MX. Likewise, you will learn about Libraries, Learning Interaction Objects, and Components.

M5 Instructional Design in the Web Space

Monday, December 8
8:30 – 11:30am & 1:00 – 4:00pm
Full day

Judith V. Boettcher, Ph.D. – Consultant, Designing for Learning

This seminar is an opportunity for faculty, faculty support personnel and administrators to explore the key issues, technology tools, and processes for designing and delivering online and distance learning programs. The key processes include developing a framework for design, exploring core learning principles, and identifying the steps in preparing courses and learning experiences for the Web and online virtual spaces. Some of the key issues include managing administrative challenges of costs, time and infrastructure needs for online learning such as faculty workload, training, and course development strategies.

M10 Increasing Institutional Productivity with a Technology Enabled Faculty

Monday, December 8
1:00 – 4:00pm
Half day

David Starrett – Associate Professor of Biology, Southeast Missouri State University

Michael Rodgers – Associate Professor of Chemistry, Southeast Missouri State

Colleges and universities worldwide have invested enormous resources in computer technology for teaching and learning. Incongruities between available resources and existing faculty technology skills are partly to blame for technology's failure to produce large gains in student learning. This seminar examines the relationship between productivity and institutional goals, along with the impact of technology on both educational and economic productivity in the academic setting. In a time of declining resources, enhancements to faculty productivity can make a compelling argument for continued instructional technology investment. Participants will explore faculty development as a means of leveraging the potential of technology to improve productivity.

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A special room rate of $119 single and double has been reserved for Syallbus fall2003 attendees. Attendees must book their accommodations by November 12, 2003, to receive the discount. After that date regular room rates will apply. Rooms at the special rate are available from Sunday, December 7, 2003, through Thursday, December 10, 2003, based on availability.

To make reservations, call 1.800.233.1234.

Parking

Hotel parking is available at a cost of $10 per day. In and out privileges are extended to hotel guests.

Shuttle Service & Directions

The hotel is 5 miles from Boston's Logan International Airport. Transportation will need to be arranged by shuttle, taxi or rental car. For rental car, see the information on this page on discounts with AVIS. For all other transportation please visit Logan International Airport's website at: www.massport.com/logan and click on "Getting To and From Logan."

Directions to the hotel can be found on the Hyatt website at: www.cambridge.hyatt.com

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American Airlines is offering attendees discounts off the lowest published fares from December 5 - 13, 2003 to Logan Airport. Please call the American Airlines travel desk at 1.800.433.1790 and use priority code #A31D3AK to receive your discounted fare.

Book early to receive the best discount.

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AVIS Rent-a-Car is offering a special discount on any size car rental for Syllabus fall2003 attendees. To receive the discounted daily and weekly rates, simply call AVIS at 1-800-331-1600 and use AVIS Worldwide Discount #D005872

Registration Deadlines

- Early Registration Discount Deadline – November 7, 2003
- Regular Online Registration Deadline – December 4, 2003
- After December 4, please register on-site. Registration will be limited to space available.

Refund & Cancellation Policy

A 100% refund less a $50 processing fee will be given for all cancellations requested before November 12, 2003. After November 12, 2003, no refunds will be given; however, all registrations are transferable to colleagues and associates with written authorization from the original registrant.

Registration Questions?

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Bronze Package

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- Keynotes & General Sessions
- Access to the Exhibit Hall
- Exhibit Hall Reception
- Poster Sessions
- Lunch Tuesday & Wednesday

Group Packages

Groups of five, ten or more attendees from a single institution who register at the same time will now realize great savings. Early bird savings apply! See rates and group registration information on page 7.

Registration

Syllabus fall2003

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Interested in networking with other paid attendees? Then be sure to check the networking box below when you register. We will then provide you and other registrants with the names, titles, institutions, and e-mail addresses of fellow attendees so that you can communicate before and after the conference.

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Registration Packages	Early Bird (Through Nov 7)	Regular (After Nov 7)
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You may also register **ONLINE** through our secure Web site at www.syllabus.com/fall2003.

Step 5 Select Your Sessions Online

After receiving your confirmation code, you may go to the registration page at www.syllabus.com/fall2003 and enter your code. Then select the conference breakout sessions that you are interested in attending. This will help us in planning logistics, however, it is not binding nor required.

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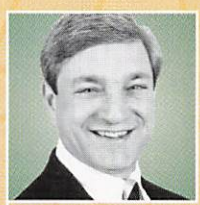
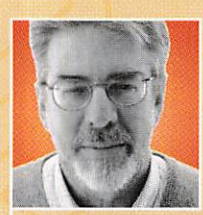


Graham Spanier, Ph.D. – President, Penn State University



Howard Strauss – Manager of Technology Strategy and Outreach, Princeton University

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Federal Computer Week

Intelligence for Better Government

The use of handheld devices can greatly assist students in science, mathematics, engineering, and technology to understand the nature of science and to be involved in meaningful scientific inquiry. Scientific inquiry involves not just the reduction and interpretation of data to understand its meaning but also the procedures for the acquisition of the data and the design of experiments to generate the data.

Beginning in the mid-1990s, the retirement of several faculty from the chemistry department at the University of Nebraska at Kearney (UNK) and the resulting influx of new, younger, faculty led to a curriculum review focusing especially on general chemistry and analytical chemistry. The announcement of funding for a major renovation of the science building then caused us to consider how a revised lab layout and structure could facilitate our curriculum.

The main result of the review was to terminate the analytical chemistry course, long a traditional quantitative analysis class, and replace it with an instrumental analysis course designed for majors, and a more environmentally focused introduction to analysis. This in turn required us to revise the second semester general chemistry course and its lab component to prepare students for these new courses. This was also consistent with an overall desire to ensure that our students were graduating as better writers and were comfortable using computers in their classes and career choices.

Chemistry Lab Experience for the 21st Century

According to "Shaping the Future," a report on undergraduate education in science, mathematics, and technology by the National Science Foundation, "... every student should be presented an opportunity to understand what science is, and is not, and to be involved in some way in scientific inquiry, not just a 'hands-on' experience."

With support from NSF, the chemistry department at UNK participated in a project to investigate the improvement of the writing of laboratory reports. As part of that review, the department established several goals for revising the laboratory experience in general chemistry. They included:

- Focusing on processes (how to pose researchable questions, how to acquire information to address those questions, assessing the quality of information) at least as much as on the transmission of facts.
- Using the vast computational power of modern programmable calculators and desktop computers to explore science, mathematics, engineering, and technology concepts and illustrate properties of matter in ways that entice and engage students.
- Ensuring that students have frequent access to active learning experiences, in class and laboratory as well as outside of class.

The computer and programmable calculator are now such central components to the conduct of science that students must be conditioned to the use of them in all aspects of their science curriculum. The power of a 1961 mainframe computer is now available in hand-held programmable calculators; the computer on board John Glenn's Friendship 7 capsule was no more powerful than the average programmable calculator that students typically bring to class with them.

To meet our goals, the department began to investigate ways that the old lab experiences, which had not changed very much since the mid-1960s, could be reframed or replaced with new or revised experiments.

Initial Trials

Two members of the department attended a Texas Instruments workshop on the use of TI programmable calculators with the Calculator-Based Laboratory (CBL) interface that allows a variety of analog sensing devices to send a digital signal to the calculator for acquisition and analysis of the data. They recommended that we pursue this as a means of meeting the goals above. Because several math classes required the use of the TI calculators we felt that this would be a reasonable approach. Also, the physics department was having considerable success using these devices in several of their beginning classes.

If we fail to give our students exposure to this part of the scientific method, we do them a grave disservice...

Several lab experiments were written and tried out by a student who had been enrolled in General Chemistry the previous semester. It was decided to pilot-trial the experiments in the next fall semester with the "trailing" section of the second half of Gen Chem. Then some surplus Macintosh computers became available and it was decided to bypass the TI calculators and CBL interfaces and interface the sensing devices directly to the Macs (via the serial port) so that data could be analyzed and displayed on the computers.

About two-thirds of the experiments that semester were carried out using this arrangement. The response of the students was very positive. Several of the students in the trailing section were repeating the class and they indicated that the sensing device/computer combination was more interesting and informative than the way they had done the labs the first time around.

Implementation

The initial positive results allowed the department to establish a new set of goals for the second semester Gen Chem lab experiences. Building on the initial results, the department decided

to start a general chemistry lab that emphasized the acquisition, interpretation, and "ownership" of data by the student; allowed for more open-ended and student-focused experiments; promoted collaboration between students; and reinforced the place of computational methodology in science.

Two more semesters of testing out various experiments using the sensing device/computer procedure allowed us to arrive at a list of about 15 experiments that met these four goals and provided the preparation for the revised analytical course. It was expected that in any given semester about 10 of the 15 experiments would be used, together with four or five that did not use the system.

The Switch to Handhelds

At this point we were ready to start preparing for the experiments in the regular second semester schedule, i.e. with much larger numbers of students than in the trial classes. It was at this point that we were notified that the renovation of the science building would not, after all, include remodeling of the labs—funding was only sufficient to renovate the infrastructure and complete fire safety and handicap requirements. Thus, the remodeled labs with computers built in to our specifications did not materialize.

This created two distinct problems. First, we no longer had enough computers for the large numbers of students in the regular schedule of the second semester Gen Chem. Second, the computers, as we were using them, took up way too much bench space. Adding more to accommodate larger numbers of students would have severely limited available bench space.

At this point we decided to move the experiments from the computers to handheld devices that could then download to computers in locations away from the lab benchtops. Palm IIIxe units were chosen because software to interface them to the sensing devices had just become available. Sufficient numbers of the Palm units were purchased initially to allow for a full lab section (typically 22-24 students) if the students worked in pairs. Working in pairs had been part of the program from the beginning; the students liked that aspect of the program, and it helped to emphasize collaboration as an integral part of scientific methodology.

The Palms were used that year in the "trailing" section of Gen Chem, in one of the regular second semester sections of Gen Chem, in the Chem for non-majors lab (in a more limited extent), and for a couple of Phys Chem labs. Student response was very positive. All the good aspects of the use of the sensing device/computer combination were reiterated, along with the convenience of the handheld units in freeing up bench space and allowing mobility as needed. The only significant problem was the periodic failure of some of the computers (older Macs) to recognize the Palm devices when trying to download data ("syncing"). This was largely fixed by assigning specific Palm devices to specific Macs for syncing.

The department was thus ready to fully implement the use of Palm devices as a major part of the lab experience for the second semester of Gen Chem and as a smaller part of the lab experience for the Chem for non-science majors course.

By this time the Palm IIIxe was no longer available and so the Palm m105 was chosen. The choice was limited to those Palm models for which an interface was available to attach the sensing devices. Initial testing showed that they worked as well as the original Palm IIIxe units. Also purchased were some new Macs (iMacs) and some PCs (Dell Optiplex GX150) units. Thus we were ready to convert all sections of second semester Gen Chem over to a lab sequence that included 10 labs based on the Palms.

Results so Far

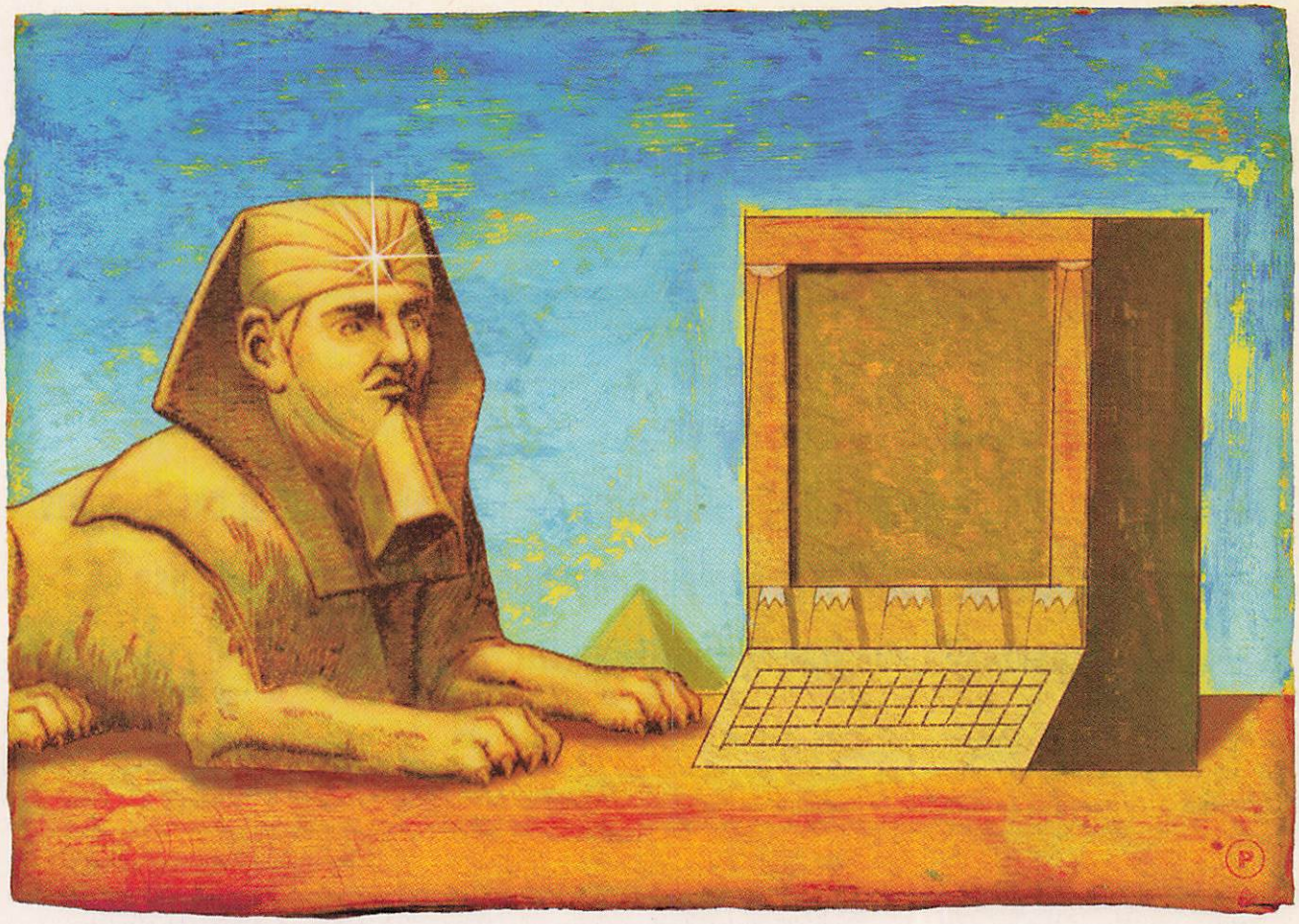
What we found was that the Palm IIIxe units continued to work well and gave few problems, the chief one being the Palms' reluctance to move easily between the I-Macs and the Dells. The Palm m105 units, however, began to show a distressing tendency to lock up their screens so that they became unresponsive to the stylus. Like the small child, when they were good, they were very good, but when they were bad they were almost useless. And, of course, both models used up batteries at a rate of several per unit per semester. Rechargeable batteries did not do the trick, as they did not seem to have the necessary power level for any reasonable length of time.

The computer and programmable calculator are now such central components to the conduct of science that students must be conditioned to the use of them in all aspects of their science curriculum.

We have a few more hurdles to overcome but the principle has been well demonstrated that the combination of sensing devices and Palm handheld devices provides a good, worthwhile lab experience for our students. The combination goes along way toward meeting the goals that we set for our Gen Chem lab program. The students are responding positively and we think that they will be better prepared for the next level of chemistry lab work.

R. David Clark, Ph.D. (clarkd@unk.edu) is Professor Emeritus, University of Nebraska at Kearney.

GIVING ONLINE INSTRUCTION



Illustrated by Peter Bennett

Online courses have come a long way toward providing a seamless connection to the learning environment and a positive experience for the learner in the virtual classroom. Now, digital video technology helps personalize the instructor's online presence.

Matthew Nickerson, Southern Utah University

HUMANITIES A HUMAN FACE

Digital video technology is transforming multimedia content on the Internet and adding exciting possibilities to online education. More powerful compression algorithms, broadening bandwidth capabilities, and inexpensive multimedia tools now make video delivery far more feasible for serious distance educators who want to maximize content delivery options. At Southern Utah University, we have created a general education humanities course for delivery over the Internet that includes video-on-demand capability that provides students with more than 150 mini-lectures in support of the course material.

One of the most obvious weaknesses of distance education is the lack of human contact between students and instructors. Nowhere is this more pronounced than in an online humanities course where "what makes us human" is the focus of the curriculum. Both instructors and students miss the opportunity to interact on a personal level when instruction takes place via Web sites, worksheets, and proctored exams.

One way to bring the human element of humanities instruction into distance education is to open the students to the spontaneous intensity and humor of the "live" lecture. The visual and aural impact of a knowledgeable and passionate instructor offers a host of learning opportunities not found in print-based distance education programs. With this in mind, we worked with an instructor known for his innovative and invigorating teaching style to create an online course that could bring a human face to online humanities instruction.

The Project

Lectures for the entire course were recorded live during the semester prior to developing the Internet course. Editing the recorded lectures into 5-10 minute mini lectures and securing still images to illustrate them all was very time consuming. The faculty instructor worked with a team of three student assistants to create the illustrated mini lectures. Development of the Internet course was funded in part with grants from the Utah Education Network (UEN) and the Utah Higher Education Technology Initiative (HETI).

SMIL

The innovative structure and delivery of the course is made possible by SMIL, Synchronized Multimedia Integration Language (pronounced "smile."), a powerful Web multimedia tool. Recommended by the World Wide Web Consortium (W3C) it allows for the creation of time-based multimedia delivery over the Web. SMIL is based on XML and allows developers to mix many types of media together and to synchronize them to a timeline.

Our humanities course for the Internet uses these capabilities to deliver video in concert with still images to create an illustrated video lecture format that is opening up new possibilities for our online instruction. The simultaneous streaming of multiple media is the key feature of SMIL that we used to create the illustrated lecture format of the class. We chose RealNetworks technology as our encoding/streaming system, which proved to be solid and reliable. The RealNetworks Player is designed to be SMIL-compatible and to take full advantage of SMIL multiple media streams.

Layout and the Player Window

The SMIL layout tag allows the player window to be customized, including the creation of multiple regions, each capable of displaying a different stream. Our mini lectures use a simple rectangular window divided into three separate regions: a video region, a menu region, and a slide region.

The Presentation Player Window

The video and menu regions take up the left side of the window with the video region immediately above the menu region. The video region displays the instructor in a tight shot, as well as any visuals he uses during the TV broadcast of the class. These visual supplements include such things as computer images, overheads, and use of the white board. The menu region lies just below the video window and is a simple point-and-click menu for navigating through the current lesson.

The slide region is the largest window and lies to the right of the other two. The slide region displays still images that illustrate what the instructor is discussing. The images are tied to the timeline of the video lecture using SMIL, which precisely synchronizes the images and lecture.

Standard video controls—play, stop, pause, fast forward, and rewind—below the video window allow students to control the flow of the presentation.

The first group of students to take the video-enhanced online course found the video to be engaging and personal, and they reacted very positively to the instructor's excitement and enthusiasm for the subject matter. But, students tended to rely too much on the video, which is meant to supplement and interact with the course reading assignments not replace them.

Streaming Media vs. CD-ROM

One draw back of Internet multimedia is the high bandwidth required for quality streaming. In our first full semester we suggested that students have access to a T1 connection or faster. The students with fast connections (T1, DSL, and ISDN) received the streaming lectures with few problems, but several students using 56K dial-up services had mixed success receiving the video stream. As a regional university in the western U.S. we are very mindful of students who live in out-of-the-way places and we are anxious to provide those students with the same educational opportunities as their urban classmates. In order to counter the problems of limited bandwidth and slower connection speeds faced by many distance students we created a CD-ROM alternative to streaming media.

The course has an optional set of six CDs available to students who request them. The CDs contain all of the media files necessary to watch the multimedia presentations. To maintain consistency and user friendliness, the CD-ROM is accessed via the course Web site, just as the streaming media are. When students are completing a lesson and reach the lecture portion, they have the option of viewing the media presentation via streaming technology or from the CD in their local computer.

The CD option is made possible through WebCT, which is our campus online course management tool. The latest version of WebCT supports CD-ROM video integration directly into the course content module. With the appropriate CD in the local drive, students can link to the media presentation directly from the course content page.

Student Feedback

Student evaluation of the course has been very positive. The media presentations allow the course content to address a much broader range of learning styles, and we believe that the enthusiastic student response reflects this broader reach.

As a new course (and a new format), our standard teacher evaluation for distance courses does not directly address media content. So, most of our feedback specific to the new technology comes from unsolicited comments received by the instructor, for example:

"I appreciate...your energetic and enthusiastic teaching style. I really enjoyed your course."

"The important thing is that I learned immensely...it really shows that you love what you do and that you care about each student."

We are very encouraged by the initial student reactions, and we are beginning a more objective, survey-based study of the effects and contributions that streaming video-on-demand, digital lectures, and multimedia content have on Web-based courses.

Instant Replay

We are pleased with success of the project to date and the positive response of students to the video lecture presentations. Though the recorded videos do not replace face-to-face discussion, feedback indicates that the video vignettes do add a personal and humanizing element. The instructor's teaching style is able to convey excitement and passion for the humanities in a way that is captivating and contagious and that would be impossible through handouts or Web sites no matter how skillfully they are created. The human element is vital when teaching art, architecture, music, philosophy, or literature, especially in a survey course. The subsequent interaction between students and teacher are richer and more meaningful when the e-mails and electronic discussions are tied to a real person, a face, and personality they are familiar with through watching the recorded lecture presentations.

The human element is vital when teaching art, architecture, music, philosophy, or literature, especially in a survey course.

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THE STANDARDS APPROACH:
Planning for Excellence in Distance Education

Linda Bruce,
Johns Hopkins Bloomberg School of Public Health

New technologies are offering many alternatives for those teaching in the distance education environment. What can instructors and those charged with distance learning programs do to ensure that they are giving students the best educational experience? Standards can help.

Promoting quality in distance education is a goal that many faculty, administrators, students, and industry executives pursue. But quality is difficult to achieve, especially with technology advancing rapidly, the numbers of courses growing exponentially, and with costs nearly always in question.

In the face of these complexities, how can higher education technologists ensure quality at all levels for everyone involved? How can they best guide growth toward these sought-after outcomes?

A systematic strategy for delivering this goal is to identify and adhere to standards of excellence, which are acknowledged values for developing and delivering technology-based instruction.

Standards for quality in a distance environment can be similar, if not identical, to standards in a face-to-face environment: they relate to active learning, a sense of community, flexibility, timely feedback, and reliable tech-

Standards: Listening to the Voice of Experience

Deciding upon and drafting a set of standards is a creative process, and as such, may defy a prescribed procedure. Just the same, looking at successful ventures and voices of experience can be helpful. The National Information Standards Organization (NISO), which is geared toward developing standards for libraries, publishers, and bibliographic and information services, has put its experiences into an outline of steps and perspectives to consider when creating standards:

- Pre-standardization workshops bring experts: "[L]eaders in an industry recognize a problem and work together toward a solution. The result is a report with recommendations. And very often, the recommendations may suggest that a standards committee be formed."
- Approved standards are published/used: "When a standard is published, [the organization] announces this as widely as possible through a variety of electronic lists, to many industry news outlets and on [its] Web site. Because we want people to use these standards, we also make them easily, quickly, and freely available for download for free from the [organization's] Web site."
- Have a maintenance agency: "Some…standards require a maintenance agency to register users, to assist in implementation of the standard, and to provide information on any changes to the standard and advice on how to implement the standard. And all standards are reviewed on a regular basis at least five years after approval and revised as the information environment changes.

With permission from National Information Standards Organization, 2003 : http://www.niso.org/creating/

Resources for Standards-Making

One of the best ways to keep abreast of developments and trends in distance education is to subscribe to some of the related listservs. A few selected lists are below:

- Distance Educator Daily News
  http://www.distance-educator.com/dnews/subscribe.php
- EDUPAGE
  http://listserv.educause.edu/cgi-bin/wa.exe?SUBED1=edupage&A=1
- Learning Technology
  http://lttf.ieee.org/learn_tech/issues/april2003/index.html
- Online Journal of DL Administration
  http://www.westga.edu/~distance/ojdla/spring61/spring61.htm
- Syllabus Update
  http://lists.101com.com/NLS/pages/main.asp?NL=Syllabus
- TLT-SWG
  http://www.tltgroup.org/listserv/tlt-swg.html
- Tomorrow's Professor Listserv
  http://ctl.stanford.edu/Tomprof/index.shtml
  http://listserv.educause.edu/cgi-bin/wa.exe?SUBED1=edupage&A=1
- EDUPAGE
  http://listserv.educause.edu/cgi-bin/wa.exe?SUBED1=edupage&A=1

nology. In a distance environment, though, standards may be expanded to relate to additional elements, such as course development timelines, complex legal issues like copyright and intellectual property, and new forms of leadership and technology infrastructure.

Typically, the primary purpose of standards is to improve the teaching and learning process. But standards can have an impact on related issues, such as teacher certification, consortia initiatives, competition for distance students, eligibility for funding, and accreditation. This last item is an especially significant issue, because accreditation "is the primary means by which higher education distance learning offerings are currently reviewed for quality," according to the Council for Higher Education.

Broad Endorsement

In the last decade—particularly in the last five years—many national and international organizations have promoted the use of distance education standards to their constituents and the educational community as a whole. The American Council on Education, for example, says, "All those involved in the learning enterprise … will benefit from principles that provide guidance in producing high-quality education with outcomes that can be clearly assessed."

And according to the American Federation of Teachers, meanwhile, online degrees, "won't be worth the paper they're printed on, credits won't be accepted for transfer, and the people who earned these diplomas will have a hard time having them accepted in the workplace and elsewhere if standards are weak."

At the same time that powerful endorsements—and warnings—have been issued about standards, many schools have been motivated to adopt their own. The Johns Hopkins Bloomberg School of Public Health, for example, set out to draft guidelines to promote excellence in the school's distance education program.

This project yielded a document centering on 18 standards areas,

including initial course planning, learning and assessment strategies, student feedback, all the way through to course ownership and student and faculty support services.

In October 2002, roughly a year and a half after the project began, our standards were officially approved. Now, as we look at how we created them and how we're using them, we feel that our process has been a good one, and that the standards will continue to be a strong, supportive element in our institution. Some of the strengths are:

- *Variety of contributors:* Students, faculty, administrators, and technical staff were included in the document's creation so that a variety of experiences, backgrounds, and knowledge would be represented and integrated.
- *Wide circulation:* The standards have been circulated institution-wide to standing committees, administrators, various constituent groups, and individuals. The objective was to give as many people as possible an opportunity to comment and contribute so that the document would be enriched and ultimately accepted and used.
- *Comprehensiveness:* The standards document is thorough, its recommendations covering all major aspects of developing and delivering courses, including instructional design, technical specifications, and support services.
- *Practicality:* The standards include many practical examples, guidelines, and suggestions to support the school community in day-to-day efforts that relate to distance education.

At the same time that powerful endosements—and warnings—have been issued about standards, many schools have been motivated to adopt their own.

Although the standards committee believes the project will have long term success, it also anticipates challenges, including making the standards accessible and useful within the school, and continually integrating them into the instructional design process and program development.

A Form for Quality

Standards will have different meanings, depending upon who is using them and what purpose they are serving. But one way to remember their value in distance education may be to look at what standards mean outside of the distance education field. For certain gardeners, for example, a standard is a "naturally-bushy plant trained to have a clear, upright stem capped by a mop of leaves." Standards in distance education might be viewed in a similar way. Each one—whether it pertains to learning design, objectives and outcomes, materials, or technology—is a leaf in the mop of a well-trained tree. Together, they can be cultivated to create a strong and viable educational program.

Standards are a foundation, a form for quality. They help us manage the present and navigate change. Take care of them. Then watch them grow.

Linda Bruce *(lbruce@jhsph.edu) is an instructional designer at Johns Hopkins Bloomberg School of Public Health's Distance Education Division.*

Best Practices

Many organizations have already created teaching and learning standards for distance education. Some standards are simple and streamlined; others are complex and full-bodied. Here is a short list of models for a variety of approaches:

- **The American Association of Higher Education:** "Seven Principles of Good Practice in Undergraduate Education" (Chickering & Gamson); "Implementing the Seven Principles: Technology as Lever" (Chickering & Ehrmann)

  http://www.tltgroup.org/programs/seven.html group.org/programs/seven.html

- **Pennsylvania State University IDE:** "An Emerging Set of Guiding Principles and Practices for the Design and Development of Distance Education"

  http://www.outreach.psu.edu/DE/IDE/guiding_principles/

- **International Distance Education Certification Center:** "Distance Education Standards and Resource Guide: Principles for Designing and Delivering Quality Distance Education Courses"

  http://www.idecc.org/

- **American Council on Education:** "Guiding Principles for Distance Learning in a Learning Society" and "Distance Learning Evaluation Guide"

  http://www.acenet.edu/bookstore/index.cfm?pubID=110

  http://www.acenet.edu/bookstore/index.cfm?pubID=109

- **Institute for Higher Education Policy:** "Quality on the Line: Benchmarks for Success in Internet-based Distance Education"

  http://www.ihep.com/Publications.php?parm=Pubs/Abstract?30

- Loyola Law School's Girardi Advocacy Center incorporates high-tech A/V.
- Miami-Dade Community College students train for the future with the latest technology.
- Oregon University System offers a more complete educational experience for all students with interactive video communications.
- University of Wisconsin-Madison involves the campus community for success in IT implementations.

Loyola Law School

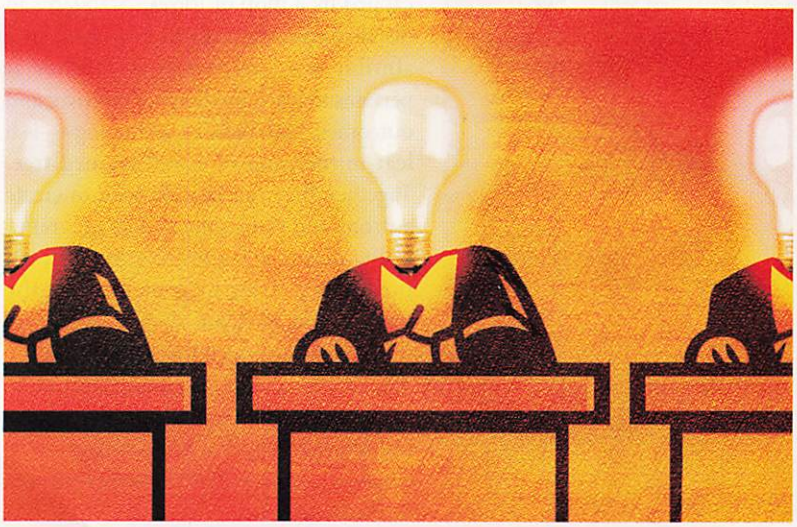
Technology is Nine Points of the Law

Educating future lawyers isn't what it used to be. Technology in the courtroom is becoming the standard for legal proceedings and Loyola's new $10 million Albert H. Girardi Advocacy Center is a prime example of how law schools are preparing their students for the future of litigation. Hoffman Video Systems, a Los Angeles-based A/V systems integration company, designed, built, and installed $1.3 million in sophisticated audio/video equipment in 10 rooms within the Advocacy Center.

High-Tech Courtrooms

Two trial advocacy classrooms were designed to simulate modern courtrooms, each with a Judges' bench seating up to three judges, counsel tables, a jury box, witness stand, and a gallery. With the technology of a wired control touch panel, the judges have the ability to direct and communicate with the parties involved without allowing the jury to see the information until it has been deemed admissible.

Jurors have 15-inch LCD panels in the jury box. A portable 50-inch plasma screen, and two rear projection screens are utilized for audience and counsel display. The movable lectern is equipped with a 15-inch LCD panel, a networked PC with keyboard and mouse, fixed gooseneck microphone, and a 10-inch control panel minimizing—if not eliminating—the need for trips back and forth to the counsel table. All of this high-tech A/V equipment enables each participant and observer of the mock trials or lectures to view data simultaneously and instantly.



The jury room accommodates twelve individuals at a fixed conference table. Hoffman equipped the room for computer and video display in single-image format with one wall-mount 50-inch plasma and a Smart-touch screen overlay, giving the jurors the ability to make notations directly onto the screen.

The Ethical Lawyering classroom accommodates 32 students in a classroom configuration with fixed desks. The room has two ceiling-mount projectors that project onto two wall-mounted Smart Boards, allowing the instructor to focus on specific parts of a document on a large screen display device. The instructor's workstation has the capability for audio reproduction and remote control of video cameras.

Control Capabilities

Hoffman designed the control room to be managed by one or two individuals, however there is enough room for four if needed. A joystick on the console operates the remote camera control for all classrooms. The operator has a master recording system, production switcher, and a 32-input mixing board connected to all the microphones, as well as a master intercom system. Mock trial proceedings, mediations and negotiations, and classroom lessons can be recorded for further study and dissection at a later date.

Karl Manheim, a law school faculty member says "Judges will need the ability to control audio and video routing, while facilitating the sharing of data and evidence among attorneys, witnesses, and jurors. The courtroom of the 21st century is an electronic one. Digital evidence, remote witnesses, and sophisticated document management systems are becoming commonplace. The face of the courtroom is changing and Loyola Law School is at the center of change with the innovative technology of the Albert H. Girardi Advocacy Center."

Karl Manheim *(Karl.Manheim@lls.edu) is a professor at Loyola Law School.*

Miami-Dade Community College

Creating Employees for the 21st Century

To find skilled workers for the 21st century's emerging disciplines like computer animation, American industry is looking to Miami-Dade Community College and its newest work of art—the Emerging Technologies Center of the Americas (ETCOTA)—to equip the next generation of talent with the necessary high-tech skills and training.

ETCOTA is a 40,000 square-foot facility linked by fiber optical cable. It offers students the advantage of instruction in 19 fully networked classrooms and a 120-seat auditorium. The building's architectural design was done by The Corradino Group with Digital Video Systems applying its A/V expertise. In each of these rooms, the center has employed and standardized on Sony's state-of-the-art audio/video solutions.

Integrated Approach to Learning

Sony's VPL-FX50 SuperSmart projectors are integral to the advanced classroom technology. Instructors can use the touch-screen panel to initiate the projector to display desired multimedia, including material accessed remotely via the Internet, on local servers, or from the college's extensive video libraries, on a 100-inch screen. For distance learning, Sony EVI-D100 robotic video cameras are used to capture, as well as record to a VTR.

"ETCOTA is one of the world's premier technology centers," says Jonathan Sussman, the center's director of industry relations. "Institutions and academics from across the country and around the world—including China, Italy, and Spain—have come here to observe our architectural design, sophisticated technology, and curricular standards so that they can emulate our fully integrated approach to learning."

Created as a partnership to meet the ever-increasing demand for highly skilled information technology workers, ETCOTA was funded in part with a $7.9 million grant from the state of Florida, Sussman explains. Classes began this past June, serving more than 1,000 students in the first semester. The college anticipates training 10,000 students annually, graduating the first class in December.

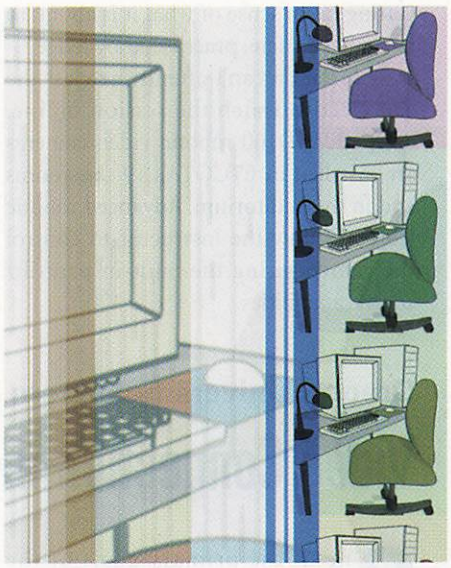
"Miami-Dade Community College has been providing exceptional training in the IT field, helping to meet our community's education and economic development goals," says Miami-Dade president Eduardo Padron. "ETCOTA has expanded our capability to help train the thousands of new workers needed for technology jobs, and we have been working with leaders of electronic commerce to help make South Florida the technology capital of the Americas."

The scale of this achievement is in keeping with Miami-Dade Community College's status as the largest college in the United States. The six campuses serve more than 160,000 students who reflect the diverse multi-ethnic, multinational cultural mix that is South Florida. For all the diversity that defines this cosmopolitan landscape, technology is the common denominator for the future.

Sussman says that Miami-Dade Community College has become an essential part of the business community by implementing new academic programs to meet the needs of industry. Its technology standards allow the freedom to plan and adapt for the future as needed.

Job Skills for the Future

Miami-based Accord Video and sister company Motion Image Communications are always on the lookout for the next generation of talent. There is a great need for computer animation



artists who are proficient using the Maya Graphics workstation, a system that creates full-motion video characters.

"Maya production is a skill that is in high demand in South Florida," explains Michael Justice, facility director for Motion Image Communications. "We have a complete Maya workstation, but we outsource our Maya work because we have never been able to find the right artist for our shop."

Alain Miranda, who is studying for an A.A. degree in computer art animation, is already working with the Maya workstation.

Miranda appreciates how visual teaching tools are especially important to his interests and will give him the skills needed to work in his chosen field. With the IP-addressability of Sony's SuperSmart projectors, instructors have instantaneous access to a wealth of media assets available on servers throughout the college, including some 10,000 video presentations, via the Ethernet. They can also project completed work done on their laptops or from a student's computer, using the touch-panel control system.

"By having the latest technology at our disposal, we get a direct experience

with the material," says Miranda. "Taking the tutorials and demonstrations off the computer and projecting them allows us to go step-by-step through the process. That takes us from getting just a sense of what it is about, to having complete, practical knowledge."

If Miranda can't attend the class, he can elect to watch the session online. Sony's EVI-D100 robotic video cameras are installed in ETCOTA's 19 classrooms and in the auditorium. Advanced robotic features allow the instructor to control the camera using the built-in pan/tilt/zoom capabilities.

Greater Flexibility for Instructors

For Giselle Siu, associate professor senior, School of Technology and Engineering, teaching in a networked classroom offers tremendous advantages.

"Preparing my examples before class and putting them on the network drive for easy access is a far more efficient way to work," explains Siu. "Before, I spent a lot of time writing on the board or typing out information and making copies. All that effort writing, erasing, and writing again is now better invested in the classroom. It's also enhanced my teaching incredibly because I can put more thought into prep work."

Teaching faculty like Siu believe that students will leave Miami-Dade Community College fully prepared to join the 21st century workforce thanks to the skills they acquire through the latest technology at ETCOTA.

Jonathan Sussman *(jsussman@mdc.edu) is the director of School of Technology and Engineering at ETCOTA, and* ***Giselle Siu*** *(gsiu@mdc.edu) is an associate professor senior at the School of Technology and Engineering.*

Oregon University System

Video Connection in Higher Education

One of the primary goals of the Oregon state university system is to ensure that graduates are prepared to meet the demands of today's global economy. This enormous task becomes even more complicated when coupled with a student population spread across a rural area.

conferencing technology," explains Lynn Weingardt, enhanced communications network engineer for the Oregon university system. "We must be able to meet the unique and diverse needs of each department. Whether they need to communicate between campuses or half-way around the world, we must facilitate face-to-face communication in unique situations. "There have been many cases where the university needed to interview an applicant or a student needed to interview with a potential employer and travel was not feasible," says Weingardt. "Instead of a telephone call as the only alternative,

> "Our goal is to provide the **most complete educational experience** to every student through the **use of video conferencing technology.**"

To meet the challenge, the Oregon university system, which comprises eight universities, 65,000 students, and 15,000 staff and faculty, is leveraging interactive video communications technology. While distance learning is the main application of the university system's video conferencing network, it is also used extensively for administrative purposes including meetings, administrative and professor interviews, and student job interviews.

Video in Action

"Our goal is to provide the most complete educational experience to every student through the use of video ensure that the connections happen."

The university system is currently using Polycom's ViewStation 512 group video conferencing systems to facilitate its distance learning program and is in the process of deploying Polycom's ViaVideo desktop video communications appliances.

The Polycom systems are used frequently for conventional distance learning applications like the Health Science University's master's nursing program. The program is based at the main campus in Portland, but students in outlying areas are able to take the classes via video.

The equipment is also leveraged to we were able to facilitate face-to-face meetings through video."

Looking to the Future

The university system is committed to leveraging leading-edge technology to deliver the highest quality education to its student population. It is currently making plans to expand its distance learning program and is also working to involve K-12 schools and community colleges in the network.

Lynn Weingardt *(lynn.weingardt@oregonstate.edu) is enhanced communications networks engineer, Oregon University System at Oregon State University.*

The University of Wisconsin-Madison ▪ By Paul Barrows and Ilene Seltzer

Modernizing a Campus by Committee

For the past several years, we at the University of Wisconsin-Madison have managed a significant IT implementation called ISIS—the Integrated Student Information System. In creating this project, we aimed to modernize all the student operations on campus, from admissions, to enrollment, to student financial processes. After an intense search process, we selected PeopleSoft's Student Administration application. Our original implementation took place in 1998, and in August 2002, we completed a successful upgrade to PeopleSoft 8, a pure Internet solution that offers real-time access to academic and administrative information through any Web browser.

Along this road to IT transformation, we learned important lessons about project management and implementation success. Today, we are reaping the benefits of Student Administration, delivering improved service to our students, faculty and staff.

We credit our successful ISIS implementation to our development of a partnership approach to project management. As we implemented, we recognized that our new technology would overhaul campus processes that had been in place at Madison for years. It became clear that threatening people's comfort zones on such a scale would be a significant exercise in change management, so we worked to involve the end user in the process.

Our initial attempts met expectations with only qualified success. While the technical implementation was successful, the impression it made on campus was not entirely glowing. Therefore, we put in place a revised and much more robust process to get additional input from a wider range of "voices" on campus. Decisions that touch virtually every member of a university community should not be made in a vacuum—or within an IT department alone.

Having built upon this partnership concept, we are pleased to share a well-tested and fine-tuned best practice that we consider our "formula for implementation success."

1. Listen to End Users

Understand what pains end users, and offer them a meaningful role in the implementation process. We assembled a core upgrade team to manage the implementation of PeopleSoft 8. But our organizational chart did not stop with that one entity. Our core committee created additional teams, each assigned to study a specific module of the new PeopleSoft software.

For example, we assembled a "Student Records Team," a "Financial Aid Team" and an "Admissions Team," among others. As we built each team, we ensured that membership included representatives from both the IT side, but more importantly, from the functional, end-user side. The Student Records Team, for instance, was managed by an assistant registrar as opposed to an IT administrator.

Taking this concept even further, we employed a Campus Implementation Committee that contained at least one representative from every school division on campus. By flagging areas that needed improvement, this group helped us prioritize the campus operations that required immediate IT attention. The committee would review proposed changes to campus procedures, test them, and offer valuable feedback on the new applications. Who better to analyze the impact of a new student administrative process than those individuals who would use the technology every day? End users' opinions were perhaps the most valuable asset during our upgrade, and their continuous involvement helped ensure a smooth adoption of the end product.

2. Communicate, Communicate

Because we had learned that the new Student Administration technology disrupted the "old way" of doing business at our university, constant, effective communication with our ultimate end users was essential. Students, faculty, and staff members needed to know which IT changes were taking place and when. We placed so much stock in this concept that we hired a full-time communications coordinator devoted specifically to the ISIS project.

Our communications coordinator built internal and external support for the new technology through a variety of methods. For example, during the initial implementation, he created a monthly newsletter that detailed project milestones such as go-lives, upgrades, and maintenance periods. We have now expanded these efforts. Today, he also distributes information about training opportunities, conducts surveys and campus forums, and manages an informational ISIS Web site. By maintaining a constant flow of information about the project, our communications coordinator helps ensure that no end user is overwhelmed by the new technology. It has made a world of difference.

Decisions that touch virtually every member of a university community should not be made in a vacuum—or within an IT department alone.

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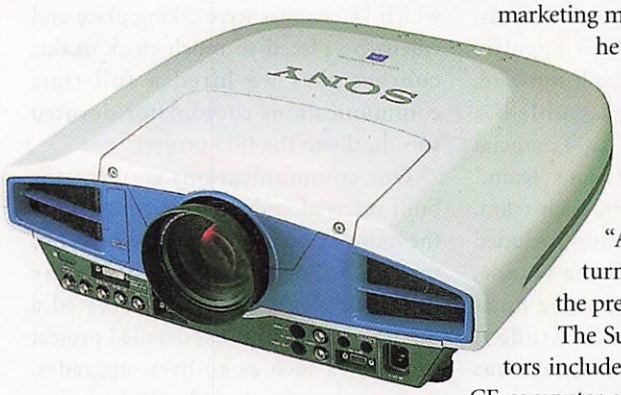
FEATURED PRODUCT ■ SONY SUPERSMART PROJECTOR

Sony SuperSmart Has Mind of its Own

What if you could walk into a classroom to make a media-rich presentation, and not have to fumble with cables, wait for the projector to warm up, or search through a set of files on your laptop for the right material? What if you could simply walk in and begin? What would you do with all of that extra time? A new line of networkable projectors aims to take the guesswork—except perhaps what to do with that additional five minutes of teaching time—out of presentations.

Developed by Sony, the SuperSmart projector series is networkable, meaning that the projector can be assigned an IP address and linked to the university LAN. Because it's networked, the projector can send and receive data, store files, and produce them on demand. Users can upload, store, and access any file they need, including Microsoft Word files, Excel worksheets, PowerPoint presentations, and JPEG, bitmap, or GIF images. "With this technology, a professor who's building a presentation can simply send the files through the LAN," said Robert Meakin, marketing manager for Sony. "When he or she gets to class, the material is already loaded and ready to use." This greatly simplifies classroom start-up. Says Meakin, "All you have to do is turn on the projector, find the presentation, and go."



The SuperSmart series projectors include an on-board Windows CE computer so that users can browse the Internet without the use of a PC. In the classroom, participants can also access content from anywhere on the network. No other software is required to get immediately connected to the campus LAN.

What's more, the SuperSmart projectors offer tremendous savings for administrators. The projector's functions are all controllable from the LAN. This allows administrators, sitting in one location, to operate, diagnose, and troubleshoot a projector in another building. In fact, they can monitor several projectors at the same time. Being able to diagnose a problem from a remote location saves time and staffing. "A professor can call the tech person from the classroom where he or she is having trouble, and the administrator can identify the problem for the professor," said Meakin. "Sometimes the administrator can even correct the problem remotely."

The SuperSmart series includes several models. The 4000 ANSI lumen VPL-FE110 projector is designed to take center stage in auditoriums, while Sony's VPL-FX51 features 5200 ANSI lumens and is best used in mid-to-large size lecture halls. The VPL-PX35 and VPL-PX40 are mid-sized classroom models featuring 2600 and 3500 lumens, respectively. For smaller classrooms, Sony's 2000 ANSI lumen model, the VPL-PX15 unit is optimal as it can also be fitted with a short-throw lens. Each of these LCD projectors is XGA or SXGA resolution.

Sony also offers an optional software program, called PJNet! network projector management software, which allows a university to centralize the administration of its AV and IT support services. PJNet! emails or pages the administrator whenever trouble occurs. It notifies administrators about lamp hour usage, filter cleaning needs, and projector warnings and errors. Through the software, administrators can detect projectors, turn them on or off, set projectors to power on and off at particular times, and access projector web pages. PJNet! even has a built-in theft detection device. If someone disconnects the projector from the network, PJNet! will notify the administrator. PJNet can control up to 255 projectors at a time.

According to Meakin, PJNet! can control some seemingly mundane functions, saving universities a great deal of money. "Just by programming PJNet! to turn off the projectors at a particular time, a university increases its return on investment," he says. Controlling on and off times saves bulbs, reduces energy demand, and lessens the need for air conditioning, since the projectors, which warm rooms, will be off when not in use.

The VPL-PX35 and VPL-PX40 models also include a direct power feature. This protects the unit in case it is unplugged before it has cooled off. The projector will continue to operate its fan until the unit is safely cooled down, even though the power from the outlet has been cut off. This is particularly important in rooms where the projector is powered on and off via a wall switch.

Sony says it is committed to providing the higher education market with a projector it doesn't have to fumble with. And you don't even have to remember to turn it off on your way out.

Contact: ***Sony Electronics,*** *Park Ridge, NJ; (800) 686-7669, www.sony.com/projectors.*

ROUNDUP ■ CLASSROOM AND LAB FURNITURE

Classroom Computing Molds Classroom Furniture

As computing has become integrated into the in-classroom learning experience, so classroom furniture has begun to adapt to new uses. The main change is simply finding ways to accommodate all the technology flowing through the woodwork. A corollary challenge is ergonomic—providing users enough control so that they can see and focus on their screens comfortably for sustained periods of time. Here are some examples of products that we think rise to the new demands expertly.

Anthro Laptop Storage Cart

Anthro offers two laptop storage carts into which students can put their laptops between classes. The 20-unit cart includes two lockable doors; the 30-unit cart has four lockable doors. Both offer built-in rear placement charging capabilities that facilitate leaving adapters plugged in at all times without having to unplug them each time users load and unload the cart. A data connection package allows users to port the local area network into the bottom of the unit and plug a wireless networking hub into the cabinet near the top where it can sit or be field mounted.

Contact: ***Anthro Corp.****, Tualatin, Ore.; (800) 325-3841; www.anthro.com.*

Computer Comforts Hide Away Table

Computer Comforts' Hide Away table was engineered specifically with multi-use classrooms in mind. The patented "Hide-Away" feature creates a student worktable that does double duty. The table is designed to hold a flat-panel LCD monitor that can easily be stored out of sight when not in use. An adjustable pneumatic arm controls the monitor and allows it to be raised or lowered with only fingertip control. A gas cylinder perfectly balances the monitor in any position. The student raises the back section of the table, reaches in, and lifts the monitor above the desk. A keyboard tray below the table completes the ergonomic picture. This table is an excellent choice for training rooms that do not always require computers.

Contact: ***Computer Comforts,*** *Houston, Tex.; (281) 488-2288; www.computercomforts.com.*

KI In Tandem

KI's new InTandem Computer Support Furniture features a distinctive setup to simplify and streamline cord management. Because of its design, there is little or no disruption to students during changes or repairs to the power and communication beam. The beam conceals all cables and separates power from other cabling, eliminating cross-talk between wires. Facility managers have complete access to the beam from both the front and back of the table; no furniture must be moved to access the beam. There are several options for wiring InTandem furniture; any leg can receive power and data wires to bring power/data to the horizontal beam, from which it then runs table to table. Shared legs between joined, side-by-side units open up the

InTandem Computer Stations

under-table area for more leg room. Tamper-resistant fasteners provide an extra level of security.
Contact: ***KI****, Green Bay, Wis.; (800) 424-2432; www.ki.com.*

MediaTech

The MediaTech SD-05 student desk is available with lockable flip-and-store monitor mounts. The flat-panel monitor flips under the desk and out of sight when not in use, replaced by a flat-top desk. The cable management system controls wiring and keeps it out of sight. The desk is available in a one- or two-student model as well as a split top version that accommodates monitors up to 19".
Contact: ***MediaTech****, Holly Hill, Fla.; (386) 258-9958; www.gomediatech.com.*

MediaTech SD 05 Student Desk

SmartDesks

SmartDesks's new FlipIT student desk functions both as a computer table and a flat-top desk. The patented technology is ergonomic and easy to use. Students simply pull out the under-desk keyboard tray, and the flat-panel monitor flips into view. SmartDesks has designed the monitor placement so that users have the most ergonomically-sound viewing angle while maintaining full visibility to the instructor and other students. A hydraulic mechanism prevents smashed fingers when the unit is closed. SmartDesks offers its own LCD monitors that self-dim to adjust to ambient lighting. FlipIT is also available without monitors for schools that plan to bring in their own equipment. An optional locking mechanism keeps the hardware safe between classes. SmartDesks also offers a universal locking system that is controlled via a remote, encoded "key." With the universal lock, all units lock simultaneously.
Contact: ***SmartDesks****, Lutherville, Md; (800) 770-7042; www.smartdesks.com.*

Spectrum Chairiot

The Chairiot is a combination desk and chair. The ergonomic design allows students to make adjustments for maximum comfort. The chair is available in two seating options: in fabric, the chair has pneumatic adjustability, swivels, and meets California 117 fire rating requirements; in polypropylene, the chair features a sculptured shell perched on a pneumatic mechanism. The shell will resist nicks, scratches, and impacts. The Multi-Use Chairiot has a rectangular desktop and the Laptop Dedicated Chairiot has a fixed laptop tray. These desks can be grouped together to save space or distributed throughout the classroom.
Contact: ***Spectrum Industries****, Chippewa Falls, Wis.; (800) 235-1262; www.spectrumfurniture.com.*

SOFTWARE HIGHLIGHTS ■ CURRICULUM SOFTWARE

Three Curriculum Software Stand-Outs

MATHEMATICA FOR STUDENTS 5 WOLFRAM RESEARCH

Billed as "one-stop shopping" software for math learning, Mathematica is arguably the most recognized name in computational technology software. Mathematica has earned its reputation by combining a numeric and symbolic computational engine, documentation system, graphics system, programming language, the world's most complete collection of mathematical functions, and advanced connectivity to other applications.

Mathematica for Students 5 has the same powerful features as the professional version at about 10 percent of the price. Only enrolled students working toward a degree at an accredited institution may purchase the product at this reduced price.

What can Mathematica do? Depending on the user's level of expertise, Mathematica can be a super-calculator or a computational powerhouse. It can handle complex equations involving millions of terms. It performs numerical modeling and simulations. It loads, analyzes, and visualizes data. It lets users create 2D and 3D animations and graphs. It has sound capabilities. It can, in fact, work with any data, not just numerical data. If you want it to process the dictionary in order to find specific types of words, it can do that. Finally, it helps users to collect, synthesize, and present

mathematical information for reports, lectures, or application development.

Users can share files, thanks to Mathematica's platform-independent notebook file format. It is also applicable to a wide range of mathematics and mathematics-heavy disciplines, including engineering, physics, computer science, and chemistry. The software is available in the following platforms: Windows 95/98/Me/NT/2000/ XP, Mac OS 7.5.3 or later, Linux (PC, Power PC) Mac OS X.

Contact: ***Wolfram Research,*** *Champaign, Ill.; (217) 398-0700; www.wolfram.com.*

BIOLOGY LABS ONLINE BENJAMIN CUMMINGS PUBLISHING CO.

Biology Labs Online consists of 12 inquiry-based interactive labs covering standard laboratory topics in introductory biology. The simulations serve a number of purposes, from complementing existing "wet" labs to augmenting hands-on labs as tools for further study.

Some labs offer content typically not covered in lab courses because of time, safety, or financial constraints. Each lab features an introduction, list of objectives, bibliography of prerequisite reading, glossary, and the lab assignment itself. Among the experimental topics are evolution, photosynthesis, cellular respiration, population ecology, and genetics. As in a hands-on lab, students control and adjust variables, run tests, and draw conclusions. Students can also design their own experiments, some of which are uniquely available in a simulation format: for instance, in the evolution lab, students can observe changes over hundreds of years.

The applets rely on smart objects that perform much like their real-life equivalents, or at least simulate their actions. For instance, students pour substrates from test tubes into flasks. They adjust light filters and gas flow. They cut and splice DNA and study the resulting mutations. Because biology is taught at several levels, the publisher offers both non-majors and majors-level lab assignments. The labs are also suitable for advanced placement Biology courses at the high school level. Labs may be purchased several ways: as content aggregates, such as genetics labs; as an entire set; or individually.

Contact: ***Benjamin Cummings Publishing Co.,*** *San Francisco, Calif; (415) 402-2500; www.biologylabsonline.com.*

RESEARCH ASSISTANT HYPERFOLIO BEDFORD/ST. MARTIN'S

Developed by Mike Palmquist of Colorado State University from software created by Learn Technologies, Research Assistant Hyperfolio (RAHF) is an innovative approach to web research. RAHF provides users with a "collection icon," a small, colorful button that appears on the browser screen. In the simplest terms, the icon is akin to a folder into which a student might put the results of a session surfing the web for source material. In reality, though, the icon is the first step in a highly evolved solution to writing research papers. Users can capture anything found on the web—including texts, images, video files, and audio files—by dragging-and-dropping it into the collection icon. The software then generates a Note Card that prompts students to complete three necessary research steps: take notes; record bibliographic information; and evaluate the source for relevance to the project. The software automatically adds the URL.

In the second step of the research/writing process, students take the various note cards, now compiled into one data set, and outline a paper or presentation using the Worksheet feature. Again using drag-and-drop, or point-and-click, students organize and string together the appropriate material, pulling from the left side of the Worksheet (the note card information) to the open page on the right. The screen looks much like the split screen displayed when one calls up a web search "history" in one's browser.

The software will, on request, generate a complete bibliography in MLA, Chicago, or APA format. Students can work with multiple note cards and multiple worksheets simultaneously for an array of organizational options. RAHF is available as a stand-alone product and also comes bundled with The Bedford Researcher, a text/CD-ROM/web site product from Bedford/St. Martin's.

Contact: ***Bedford/St. Martin's, Boston,*** *Mass; (800) 779-7440; www.bedfordstmartins.com/.*

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Designing the Space, *continued from page 13*

WJM: I think it'll be a mix of things. Obviously Web-based, asynchronous, ubiquitous provision of learning materials is going to be one important thing, along with telecommunications for very flexibly establishing synchronous links. I think things like remotely operated sharable laboratories are going to be extremely interesting and a new way of thinking about resources. I think we'll see increasingly sophisticated audiovisual capabilities being used. I don't think that there are any great surprises in any of that, but I think we'll really see all of those things developing and merging and defining a pretty seamless broad-based electronic learning environment.

S: What would you say is the main thing to consider about the design of future instructional spaces?

WJM: The fundamental point is that learning technology shouldn't dominate. It should be unobtrusively and ubiquitously supportive and it should enable us to re-humanize learning spaces rather than make technologically oriented spaces. And one should allow an enormous amount of flexibility.

S: And is there a particular bit of wisdom about designing learning spaces that you always keep in mind?

WJM: The incredible unpredictability of the engagement of technology with culture is the lesson that comes out over and over again, which means you've got to be incredibly sensitive to the way technology and culture come together and ready to rethink assumptions and develop new experiments and transform the way you do things. You've got to be able to turn on a dime.

[Editor's note: William Mitchell will be the opening keynote at the Syllabus fall2003 conference in Cambridge, Mass., December 9, 2003.]

Case Studies, *continued from page 35*

3. Make Training Valuable

As we executed our implementation, we devoted key resources to training programs. Two full-time staff members designed and facilitated regular training sessions on the new technology. We also extended our limited resources with auxiliary training "coaches," campus experts who were given extra training.

Making training valuable is an important lesson learned. Even today, with every go-live or upgrade on our campus, more training becomes necessary. Our training staff must constantly find ways to keep curricula fresh for trainees.

4. Remember: Measure Success

After an exhausting IT upgrade, measurement is usually the last thing on an organization's mind. However, evaluation of one's system could not be more important. At Wisconsin, we have invested heavily in our PeopleSoft project. We had buy-in from the highest levels, and we wanted to demonstrate the beneficial return on the university's investment. Prior to and throughout the implementation, we conducted surveys and focus groups to learn what end users desired in the new system. Post-implementation, and now again post-upgrade, we have conducted additional surveys of our entire end-user community.

Unifying our student administration systems was not just an exercise in effective project management—it was also a case of designing a process that would facilitate effective group decision making.

While initially in need of fine-tuning, the project now runs smoothly because all levels of the university were involved in the process. Every member of our core and auxiliary committees was able to offer a unique perspective about their technology needs, preferences, and processes. And these contributions greatly enriched a dialogue that fostered a smooth and successful system implementation.

Paul Barrows *(barrows@mail.bascom.wisc.edu) is vice chancellor for Student Affairs and* ***Ilene Seltzer*** *(ilene.seltzer@das.wisc.edu) is integrated student information system manager, both at the University of Wisconsin-Madison.*

Reflections, *continued from page 42*

rather than sending instant messages to potential mates. Great faculty, even in the dumbest of classrooms, will initiate much more effective learning than mediocre faculty in the most advantageous environment.

A smart classroom is just a set of tools for students and teachers. Better tools, however, don't always help. For example, Photoshop may be at the pinnacle of image editing software, but most of us will make a far better drawing with pencil and paper in less time than it would take us to figure out "superior Adobe technologies such as cross-product color management tools, Smart Object technology, and transparency." Even mastering Photoshop will not make most of us artists nor will smart classrooms make most teachers into paragons of pedagogy.

Without appropriate training, even the most wonderful tools are usually useless. Often, misuse of tools is harmful, or in the case of a driver going 60 miles per hour while absorbed in iDrive menu hierarchies, potentially fatal. We may not kill any students or faculty with irkonomic, smart classrooms, but those classrooms may actually inhibit learning. The tools a smart classroom needs are those that can be used with almost no training. That reduces smart classrooms to classrooms with projection and network connectivity. That turns out to be a good thing since such classrooms are affordable and the equipment may actually get used.

Car and Driver says that the BMW 760Li is "less endearing to operate than to sit in." For an ultimate driving machine with a price of $116,450, that is a tragedy. For that price you could build a smart classroom that would be less endearing to learn in than to sit in or instead you could invest your money in smart learners and smart teachers. It wouldn't be as snazzy as iDrive or iLearn, but humans, not classrooms, are the ultimate learning machines.

Howard Strauss (howard@princeton.edu) *is the manager of technology strategy and outreach at Princeton University.*

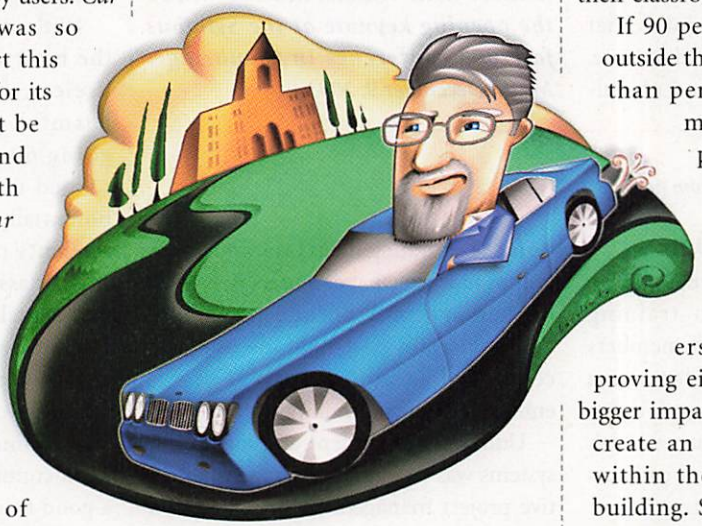
Howard Strauss

REFLECTIONS

ANOTHER LOOK AT EDUCATION TECHNOLOGY

Smart Classrooms: The Ultimate Learning Machines?

Ah, the wonderful BMW 7 Series automobiles; not only the ultimate driving machines, but also the smartest cars on the road. The 7 Series comes with revolutionary iDrive. While some believe that the i stands for *intelligent*, others insist it stands for *irkonomics*—the application of technology to confuse and annoy users. *Car and Driver* magazine was so impressed with how smart this car is that they praised it for its "funky controls that must be explained to valets and anyone else entrusted with moving the car." The *Car and Driver* technical editor was awed by the near-human intuition programmed into it: "This car," he said, "is always making assumptions about what you want or how you should drive. It would be better if some of those assumptions were right." The *New York Times* further explained the power of irkonomics. "[After] 45 minutes ... going over the car's features ... I still did not know enough to operate the radio myself."



iDrive is managed by a single joystick-like control where you'd expect the gear shift lever to be. By moving it in one of 8 directions and then rotating its knob, you can press its top to make your selection from 700 functions and menus that display on a small screen. This is such a technological tour de force that the *New York Times* suggested, "the steering wheel seems like an afterthought." Oh yes, while you're browsing those 700 menus, you have to drive.

We are pouring zillions of dollars into our smart classrooms to apply the same irkonomic principles used so effectively in BMW's iDrive—perhaps we should call it *iLearn*—with similar results. The overwhelming majority of learning does not take place in classrooms. It takes place in dorms, at home, in study groups, in the library, on walks in the park, in the shower, in labs, in conversations, in interactions with online content, and always in the heads of the people learning.

For example, people do not learn to read in classrooms. They get introduced to the subject by teachers. They are shown pictures of the alphabet, appropriate books to read, CDs on pronunciation, and so forth. Then they read everything they can. Their parents, peers, and relatives read to them and with them. Their support groups show them in dozens of ways the importance of reading. They might easily read 10 hours for every hour spent in the classroom. If students confined their learning to just their time in the classroom, their reading comprehension would be abysmal. That's just what happens to children who do no learning outside their classrooms.

If 90 percent of learning is done outside the classroom then no more than perhaps 20 percent of the money we spend on improving learning should be directed to our classrooms. In a classroom setting, the most critical things are the students and the teachers. Money spent on improving either of those will have a bigger impact than anything we do to create an iDrive-like environment within the physical confines of a building. Schools need more motivated, creative students with a solid grounding in the prerequisites for a course and the knowledge of how to find and use information. That will enhance learning in a classroom more than 700 multimedia gadgets accessible via controls, the mastery of which would gain one instant admission to Mensa. Classrooms need enthusiastic, well-prepared teachers who love teaching as much as the subject they teach and understand and use good pedagogy. They will be able to make learning such an enjoyable imperative to students that their students will use their laptops in class to work on extra credit simulations

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If black & white is so engaging, then why don't they make highlighters in gray?

Black and white blends in—color gets you noticed. It's a simple, colorful fact. So it just stands to reason that if you use HP color in your school's documents, key points will draw attention to themselves. People take notice of your work, which in turn highlights how clever you are.

To find out more about the HP Business Inkjet 2280 or learn other ways HP color can make your school shine, visit www.hp.com/go/pscolorad6.

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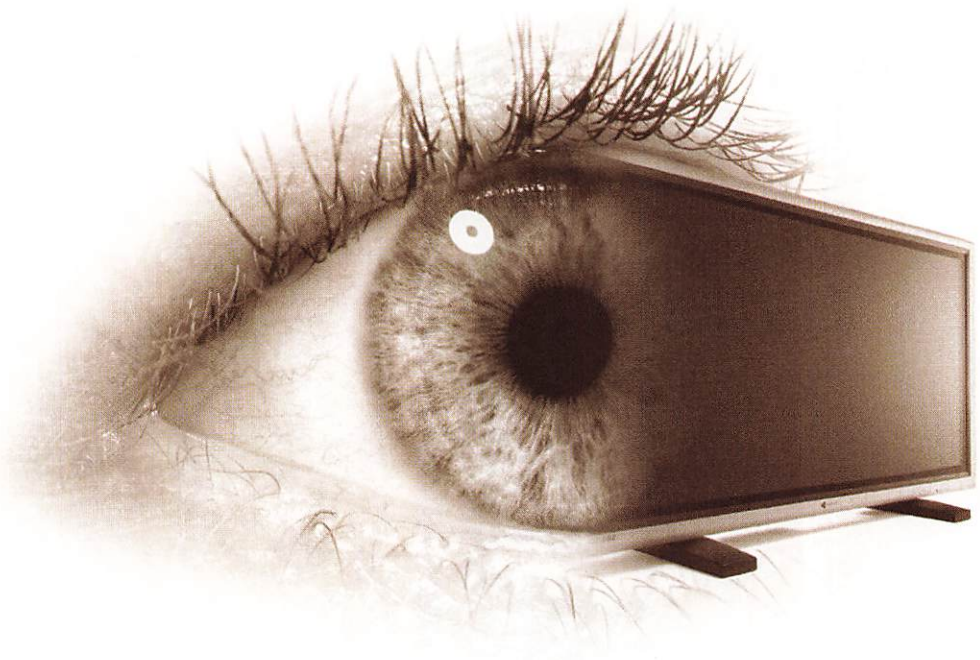
HUMANOLOGY



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